CONSTRUCTING A SOPHISTICATION INDEX AS A METHOD OF MARKET SEGMENTATION OF COMMERCIAL FARMING BUSINESSES IN SOUTH AFRICA

HENDRIK JACOBUS DION VAN ZYL

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STUDY LEADER: PROF. G. PUTH

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DECLARATION

I declare that this is my own unaided work, and that it has not been submitted to another university for any degree.

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Signature   Date

ABSTRACT

This study investigates the process of index construction as a means of measuring a hypothetical construct that can typically not be measured by a single question or item in a survey study and applying it as a method of market segmentation. The availability of incidental secondary data that were gathered during 2009 provides a relevant quantitative basis to illustrate this process by constructing a commercial farming sophistication index for South Africa.

A multi-step approach was followed for the construction of the commercial farming sophistication index, namely: (1) Selection of items and definition of variables that are most likely to be indicators of commercial farming sophistication; (2) combining of variables into an index; and (3) segmentation and index validation.

Following the investigation and illustration of the process of index construction as a method of market segmentation, it was evident that this approach offers an appropriate and useful means of segmenting a market. Several factors contribute to the appeal of this approach. Amongst other, it contributes towards addressing important priorities in the area of future segmentation research, namely that of investigating the application of new base variables into segmentation models, as well as investigating new segmentation strategies. The approach also applies a creative process of combining several base variables into a single measure, namely that of an index variable. By offering classification rules based on characteristics that can easily be observed or elicited by asking a few key questions, new or potential buyers can be grouped by buying behaviour segment.

Furthermore, the multi-step process that was employed has pragmatic appeal for researcher, and provides a systematic and structured multivariate approach to segmentation. It also facilitates replication of the process when conducting future studies.

By using an index, it takes advantage of any intensity structure that may exist among attributes. This has the advantage that it places members of the market on a continuum that can lead to tracking members' development paths as they progress towards higher levels on the index.

Furthermore, illustration of the process has significant application value in other business-to-business markets, locally and internationally, where index variables can be constructed from both primary and secondary sources and used as a method of segmentation following a similar multi-step approach proposed in this study.

Lastly, the outcome of this type of segmentation method offers researchers and marketing practitioners a procedure, in the form of an equation, to calculate index scores and provide rules to segment the market based on predefined intervals. Hence, the challenge to replicate segment formation across independent future studies is addressed. This process is considered an advantage over employing a technique such as cluster analysis, where the use of new data or changes to the clustering algorithm often leads to different segment solutions.

Keywords: Segmentation, index construction, commercial farming, business sophistication

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CHAPTER 1: INTRODUCTION

1.1   BACKGROUND

Marketing researchers and practitioners often make use of index construction as a means of measuring some hypothetical construct. There are several reasons for this. Firstly, despite the efforts of researchers to design studies that can provide valid and reliable measurements of variables, it is seldom possible to develop single indicators of complex concepts in advance. Consideration of several data items as a composite measure might therefore provide a more comprehensive and accurate indication of the construct being studied contributing towards the validity and reliability of measurement (Babbie, 2011:168). Secondly, data items that form the basis of an index are typically scaled or ordinal in nature. As such, an index variable takes advantage of any intensity structure that may exist among attributes. Thirdly, indexes are efficient at reducing data, as several inter-related items may be summarised in a single numerical score. Yet, despite these reasons, the application of index construction as a method of market segmentation seems to have been neglected in the field of marketing.

This study focuses primarily on this process, namely that of constructing an index as a means of measuring a hypothetical construct that can typically not be measured by a single question or item in a survey study and applying it as a method of market segmentation. This approach addresses a crucial focal point in any market segmentation study, namely that of identifying and selecting a relevant segmentation base that can differentiate successfully between segments (Lin, 2002:249). Ultimately, the role of market segmentation is to inform the development of a marketing strategy (Freathy & O'Connell, 2000:102), which contributes towards business success.

When considering the essence of market segmentation it seems quite simple in its rationale, namely to divide a diverse market into several homogeneous sub-markets (Lin, 2002:249) based on similar needs and buying behaviour, and which would be likely to respond very similarly to a particular marketing programme (Dibb & Wensley, 2002:234). Canever, Van Trijp and Van der Lans (2007:512) describe market segmentation as a process of matching the needs and wants of buyers, on the one hand, with the offerings of the business, on the other hand. This relates back to the economic school of finding equilibrium between the demand (of buyers) and the supply (of the business). This process should ultimately result in the accomplishment of the goals of both sides. Market segmentation is therefore regarded the same irrespective of the buyer or product (Dibb & Wensley, 2002:233). The key assumptions and intended outcomes of market segmentation hold for both business and consumer markets for two main reasons (Goller, Hogg & Kalafatis, 2002:256). Firstly, these markets consist of a diverse number of end-users. Secondly, because the application of products can vary considerably, buyers seek different product benefits.

However, despite being described as simple in its rationale, the process of segmentation is not necessarily easy, but requires a thorough and detailed understanding of the market (McDonald & Dunbar, 2004:xv). In addition, various considerations should be taken into account as part of the segmentation process, including that of defining the aim of performing market segmentation; defining the market; selecting of segmentation variables and a suitable segmentation approach; and determining the research design.

The literature provides ample examples of variables used as bases or descriptors in segmentation studies (Canever *et al.*, 2007:512; Ferrell & Hartline, 2005:142; Lin, 2002:250; McDonald & Dunbar, 2004:185; Weinstein, 1994:159). However, these variables do not always provide in the necessary descriptions required by marketing practitioners. This results in researchers defining and developing new constructs for measurement. Leedy and Ormrod

(2010:92) refer to a construct as a variable that cannot be directly observed, but is assumed to exist, based on some pattern of behaviour or combination of characteristics.

Secondary data gathered during 2009 amongst commercial farming businesses in South Africa by an independent research house, provided recent data to illustrate the process and application of index construction as a method of market segmentation. The commercial farming market is therefore regarded incidental within the specific context of this study. However, it is believed that numerous other opportunities exist across different business markets where similar processes of index construction and segmentation can be applied.

1.2 PROBLEM STATEMENT

Market segmentation is regarded essential by marketing practitioners amongst other for targeting, proposition development, price formulation and developing of mass communication (Bailey, Baines, Wilson & Clark, 2009:227). However, tension exists between theory and practice in the field of market segmentation, with many marketers expressing concern about implementation and the integration of segmentation into marketing strategy (Dibb & Simkin, 2009:219). To address this, priorities in the area of future segmentation research include the selection and incorporation of new variables into segmentation models, as well as developing new and innovative segmentation strategies (Dibb & Simkin, 2009:222).

A specific area of segmentation development that has been neglected in the academic literature but holds particular pragmatic relevance for marketing practitioners is the process of index construction as a method of market segmentation. The vast array of possible variables available for segmentation purposes often complicates the process, particularly in cases when these variables measure a single underlying construct. In addition, traditional external

segmentation variables do not necessarily provide insight into buying behaviour, and as a result contribute little in the formulation of marketing strategies. Furthermore, segmentation studies often rely on a cluster-based approach, utilising data that are rarely well structured. This leads to different segment solutions when changes are made to the clustering algorithm. Replication of segmentation solutions becomes a challenge.

Alexander, Wilson and Foley (2005:113) note an additional challenge that agribusiness managers and salespeople face. While an understanding of current buying behaviour is valuable, this information becomes much more valuable if new or potential buyers can be classified by buying behaviour segment. Furthermore, classification rules are most useful if it is based on characteristics that can easily observe or elicit by asking a few key questions.

Lastly, an extensive search of leading electronic journal databases, including EBSCOHost, Emerald, Google Scholar, Proquest, ScienceDirect, SpringerLing and SA ePublications has also provided little evidence of academic efforts to investigate and illustrate this process and method of market segmentation.

The stated priorities in the area of future segmentation research, the gap in the academic literature as well as the limited pragmatic evidence of this process provides arguments for the need of this study.

1.3   PURPOSE STATEMENT

The purpose of this study is to investigate and illustrate the process of index construction as a means of measuring a hypothetical construct that can typically not be measured by a single question or item in a survey study and applying it as a method of market segmentation. This process is illustrated by the construction of a commercial farming sophistication index for South Africa and applying it as a method of market segmentation. While the commercial farming

market and the availability of secondary data utilised should be regarded as incidental, it provides within the specific context of this study a relevant and recent quantitative basis to illustrate this process. Lastly, through all of this to assess the use of index construction as a market segmentation method.

1.4   RESEARCH OBJECTIVES

The following research objectives guide the study:

- To investigate the process of index construction as a means of measuring a hypothetical construct that can typically not be measured by a single question or item in a survey study and applying it as a method of market segmentation.

- To illustrate this process by means of constructing a commercial farming sophistication index for South Africa and applying it as a method of market segmentation.

- Through all of the above, to assess the use of index construction as a market segmentation method.

1.5   IMPORTANCE AND BENEFITS OF THE STUDY

This study contributes to the academic literature by addressing important priorities in the area of future segmentation research, namely that of investigating the application of new variables into segmentation models, as well as investigating new segmentation strategies. Incorporating innovative segmentation approaches, processes and methods that can improve one's understanding of the market is valued by marketing practitioners. This contributes towards realising the advantages of market segmentation, which are promoted extensively in the literature (Dibb, Stern & Wensley, 2002:113; Ferrell & Hartline, 2005:134; Freathy & O'Connel, 2000:102; Goller *et al.*, 2002:263; McDonald & Dunbar, 2004:34). These include homogenising market

heterogeneity, improving an understanding of buyers, the identification of new market opportunities, better allocation of business resources and skills, and improved performance and competitive advantage.

From a practical perspective, understanding how such a method of segmentation can be applied holds significant value for researchers and marketing practitioners that will be engaging in future segmentation studies.

It also contributes towards applying a new and creative segmentation base that offers more discriminating power in explaining market behaviour, than the often very limited explanatory value offered by traditional external variables. In addition, offering rules to construct such a new and creative segmentation base that is based on characteristics that can easily be observed or elicited by asking a few key questions, hold significant value for conducting future segmentation studies.

Furthermore, illustration of the process also has wider application value in other business-to-business markets, locally and internationally, where index variables can be constructed from both primary and secondary sources and used as a method of segmentation following a similar multi-step approach proposed in this study.

Lastly, despite commercial farming businesses being an incidental market focussed upon in this study to illustrate the process under consideration, the construction of a commercial farming sophistication index and presenting of rules for segment formation holds significant immediate and practical value for marketing practitioners and input suppliers that plan to conduct market segmentation studies where commercial farming businesses are targeted.

1.6 RESEARCH RESOURCES AND METHODS

To investigate and illustrate the process of index construction as means of measuring a hypothetical construct and applying it as a method of market segmentation, this study utilised secondary data that were originally gathered during a survey in 2009 by an independent market research organisation amongst a sample of commercial farming businesses in South Africa. A structured questionnaire was used as data gathering instrument. From the questionnaire, items were identified that on face value were believed could contribute to constructing a particular index of commercial farming sophistication. In the context of this study the availability of the data, as well as the original questionnaire used and sampling frame targeted during the survey, are therefore considered incidental and serves solely to illustrate the process of index construction as a method of market segmentation.

A sample of 876 was derived from the 2009 study, and used in the subsequent analysis. This sample size was judged to be sufficiently large enough given guidelines from the literature when embarking on index construction.

The quantitative approach that was followed in this study is supported by other research projects that have also employed similar underlying approaches for index construction (African Response, 2006:20; Jensen, Krishan, Spittal & Sathiyandra, 2003:79; South African Advertising Research Foundation, 2009:92). More importantly, these studies have all applied index construction as a method of market segmentation.

This study followed a multi-step approach in the construction of the commercial farming sophistication index, namely: (1) Selection of items and definition of variables that are most likely to be indicators of commercial farming sophistication; (2) combining of variables into an index; and (3) segmentation and index validation. The research design and methods will be discussed in more detail in Chapter 4.

1.7   STUDY DELIMITATIONS AND ASSUMPTIONS

The delimitations and assumptions that relates to this study is discussed in the sections that follow.

1.7.1   <u>Delimitations</u>

This study has several delimitations relating to its context, constructs and theoretical perspectives. Firstly, the study's literature review is primarily limited to literature from the discipline of market segmentation. Literature from related disciplines, such as strategy development and strategy implementation has only been consulted in passing.

Secondly, the primary purpose of this study is to investigate and illustrate the process of index construction and applying it as a method of market segmentation. Though numerous different indices can be constructed to illustrate this approach, this study considers the process of constructing a commercial farming sophistication index utilising accidental secondary data available that was originally gathered in 2009. The construct of commercial farming sophistication can be generally conceptualised as the relative degree of complexity of structures, systems, strategies and practices employed across various functional areas in a commercial farming business.

Thirdly, the literature makes reference to various approaches and methods that can be followed to construct an index as a means of measuring some hypothetical construct. This study followed a multi-step approach that was adopted from that followed in the construction of the African Response Business Sophistication Measure (BSM), namely: (1) Selection of items and definition of variables that are most likely to be indicators of commercial farming

sophistication; (2) combining of variables into an index; and (3) segmentation and index validation.

Fourthly, while various statistical techniques can be considered to derive or construct an index, this study employed principal component analysis as part of the process. This technique is similar to that used during the construction of the African Response BSM.

Fifthly, this study it is not concerned about measuring the relationship – be it direct, or as a moderating influence – between the levels of business sophistication and performance, although this relationship is hypothesised in the literature (Hahn, 1999:20).

Lastly, the original data were gathered by means of a structured questionnaire and a mail survey. From this secondary data were derived, which provided a relevant quantitative base that could be used for the construction of the commercial farming sophistication index. It is acknowledged that numerous other possible questions could be formulated and considered as potential predictors of commercial farming sophistication, however, the availability of the secondary data and items derived are considered incidental in the context of this study.

1.7.2 <u>Assumptions</u>

The following basic assumptions underlie the research study. It is assumed that:

- Commercial farming sophistication is a hypothetical but measurable construct that can be measured in the form of an index.

- The process of index construction as a method of market segmentation can be investigated and illustrated through the construction of a commercial farming sophistication index.

- The secondary data derived from the 2009 MSSA study, despite being considered incidental in the context of this study, provide a relevant

measurement base that could be used for the construction of a commercial farming sophistication index.

1.8 DEFINITION OF KEY TERMS

This study involves a number of key concepts. The manner in which these key terms are defined for the purpose of this study is considered below.

Business sophistication: Business sophistication can be generally conceptualised as the relative degree of complexity of structures, systems, strategies and practices employed across various functional areas in a business.

Commercial farming sophistication: Building on the definition of business sophistication, commercial farming sophistication can be generally conceptualised as the relative degree of complexity of structures, systems, strategies and practices employed across various functional areas in a commercial farming business.

Commercial farming business: For this study, the definition of Statistics South Africa is used, namely: any farming business within the boundaries of South Africa that produces agricultural products intended for the market (Statistics South Africa, 2007:19).

Index: Babbie (2011:68) notes that a single data item sometimes only gives us a rough indication of a given variable, while the consideration of several data items might give us a more comprehensive and accurate indication. Index variables are composite measures of variables; and they are typically scaled or ordinal in nature. In other words, index variables take advantage of any intensity structure that may exist among attributes.

Market: A market is a collection of buyers and sellers (Ferrell & Hartline, 2005:134).

Market segmentation: Although a number of definitions of market segmentation are referred to in the literature, this study views market segmentation conceptually as a process that aims to homogenize a heterogenic market by identifying market segments that are similar with regard to particular characteristics, be these behaviour, demographics, needs or any other, but distinctly different between the segments. It is also anticipated that buyers within a segment would respond similarly to a particular marketing mix, leading to more effective allocation of a business's resources and thereby to an increase in competitive advantage.

Table 1 shows a list of the acronyms used in this document.

Table 1:   Acronyms used in this document

Abbreviation	Meaning
AMPS	All Media and Products Survey
ANOVA	Analysis of variance
B-to-B	Business to business
B-to-C	Business to consumer
BSM	Business Sophistication Measure
CFA	Confirmatory factor analysis
ELSI	Economic Living Standard Index
ha	Hectare
ICT	Information and Communications Technology
IT	Information technology
KMO	Kaiser-Meyer-Olkin
LSM	Living Standards Measure
PC	Personal computer
SAARF	South African Advertising Research Foundation
VAT	Value added tax

1.9   STRUCTURE OF THE THESIS

Chapter 1 provides an introduction to the study by presenting the background, problem statement, purpose statements, research objectives, the importance and benefits of the study, the delimitations and assumptions, as well as the definitions of key terms.

Chapter 2 provides a focused review of the literature pertaining to the theoretical foundation of market segmentation.

Chapter 3 provides a review of the literature on index construction. Specific attention falls on the processes that have been followed in past studies moving from index constructing to applying it as a method of market segmentation.

Chapter 4 provides a discussion of the research design and methods employed, including source of data, sampling and details of the data analysis plan.

Chapter 5 presents the results derived from the analysis of the secondary data, index construction and market segmentation.

Chapter 6 offers conclusions emanating from the research findings. The implications that the findings hold for researchers and marketing practitioners are discussed. Areas for future research are noted.

CHAPTER 2: MARKET SEGMENTATION

2.1 INTRODUCTION

This study focuses primarily on the process of index construction as a method of market segmentation. This process is illustrated by making use of the availability of incidental, but recent and valid secondary data to construct a commercial farming sophistication index for South Africa and using the index to segment the market. Investigating and assessing this process contributes towards the value of what a market segmentation logic can offer the marketing theory. As such, it is deemed important to first establish and review the foundations of market segmentation by reflecting, amongst other issues, on the various definitions, what a market segmentation logic could offer marketing theory, the processes involved, the antecedents, the key success factors, various approaches, and some typical bases of market segmentation.

2.2 MARKET SEGMENTATION AS PART OF MARKETING MANAGEMENT

Marshall (in McDonald & Dunbar, 2004:xi) postulated that to know your market is one of the abiding principles of sound business practice. The use of market segmentation, as part of the strategic marketing process, is however not new (Freathy & O'Connell, 2000:102); and it has been widely used in practice by businesses as part of their marketing management process (Dibb, 2005:13; Ferrell & Hartline, 2005:134; Freathy & O'Connell, 2000:102; Lin, 2002:249). The extensive use and application of market segmentation in the market demonstrate its importance and value as being an integral part of marketing management. In fact, Dibb (1998:394) noted that market segmentation has even been described as the panacea, or cure-all, of modern marketing.

McDonald and Dunbar (2004:14) emphasised the importance of market segmentation, as part of marketing management, by arguing that together with a correct definition of the market and the subsequent product and service positioning, it forms three of the fundamental determinants of corporate success.

For the majority of businesses operating in competitive markets, consistently meeting the needs and wants of clients and buyers is a daunting task. This is, furthermore, complicated by having limited resources and skills, thereby restricting the abilities to pursue a broad-based marketing perspective. Market segmentation provides a process of combining groups of buyers into larger buying units, which makes the marketing activities of companies both cost-effective and manageable (McDonald & Dunbar, 2004:xv).

In other words, market segmentation provides a means of homogenising a diverse market (Dibb, 2005:13). The essence of market segmentation is, therefore, quite simple in its rationale, namely, to divide a diverse market into several homogeneous sub-markets (Lin, 2002:249) – based on similar needs and buying behaviour, and which would be likely to respond very similarly to a particular marketing programme (Dibb, 1999:108).

However, despite being described as simple in its rationale, the process of segmentation is not necessarily easy; it requires a thorough and detailed understanding of the market (McDonald & Dunbar, 2004:xv), which includes the selection of relevant segmentation bases and descriptors (Lin, 2002:249).

According to Dibb and Simkin (2009:220), Wind's (1978) seminal review of research in market segmentation culminated in a research agenda for the subject area. Four main priority areas were mentioned, namely: the development of segmentation bases and models across varied products and contexts; the development of more relevant research methodologies and in particular in relation to data requirements and collection methods; the

development of advanced and flexible statistical analysis tools; and lastly, the development of new conceptualisations of the segmentation problem, integrating segmentation research into strategic decision-making, and evaluating its effectiveness.

The development of a particular segmentation base forms a focus element of this study, with the emphasis falling more specifically on the process of index construction as a method of market segmentation.

2.3   DEFINING MARKET SEGMENTATION

Since first being introduced in the literature by Frederick more than 75 years ago, the concept of market segmentation has seen growing importance amongst marketing practitioners (Goller *et al.*, 2002:252). Looking even further back, the underlying principles of market segmentation are rooted in the theory of economic pricing, which suggests that price discrimination could be used to maximise profits amongst different buyer groups (Quinn *et al.*, 2007:440). However, the seminal paper by Smith (1956) is widely acknowledged as having firmly introduced the concept of market segmentation to the marketing domain (Quinn *et al.*, 2007:440).

A number of authors have proposed definitions of market segmentation, most of which bear a similar underlying understanding of the process. Smith (1956:6) noted that "market segmentation consists of viewing a heterogeneous market (one characterised by divergent demand) as a number of smaller homogeneous markets in response to differing product preferences among important market segments". Ferrell and Hartline (2005:135) define it as a process that divides a total market into a number of smaller, more homogeneous submarkets, termed market segments.

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Foedermayr and Diamantopoulus (2008:223) define it as the process of subdividing a market into distinct subsets of buyers who all behave in the same way or have similar needs. Lin (2002:249) states that a market segment is a group within a market that is assumed to be quite similar in their needs, characteristics and behaviours.

Freathy and O'Connell (2000:102) postulate that the credibility of market segmentation is based on two key assumptions. The first of these assumptions is conceptually aligned to that which is generally proposed by the authors mentioned above, namely that buyers can be grouped into segments that display homogeneous preferences when compared with the other segments. The second assumption, however, addresses an outcome-related aspect of market segmentation, namely, that returns which emanate from the process are likely to be greater when companies match their products and marketing mixes to particular segments within the market.

Canever *et al.* (2007:513) also made mention of this latter aspect, noting that segmenting a market implies that various segments could be distinguished. This allows a business to select one or more segments to target. The fundamental requirement is to formulate relevant marketing strategies and mixes, which are tailored to the needs and wants of each of the segments targeted. According to Canever *et al.* (2007:513), this process of segmenting, targeting and positioning "has been shown to improve a seller's capacity to identify market opportunities, and to make fine adjustments to their products, prices, distribution channels and promotional mixes."

Comparing the noted definitions with the one originally formulated by Smith (1956:6), it is evident that market segmentation is conceptually a process that aims to homogenize a heterogenic market by identifying market segments that are similar with regard to particular characteristics, be these behaviour, demographics, needs or any other, but distinctly different between the segments. It is also anticipated that buyers within a segment would respond

similarly to a particular marketing mix, leading to more effective allocation of a business's resources and thereby to an increase in competitive advantage.

In essence, segmentation may be viewed as a means of imposing a structure on the market, in order to simplify the formulation and implementation of marketing strategies (Dibb, 1999:107).

Smith's (1956) rationale for market segmentation was based on the matching of changing market needs on the demand side, with more precise adjustments of products and marketing needs on the supply side of a market (Quinn *et al.*, 2007:440). This rationale again confirms the strong link that the concept of market segmentation has with macro- and micro-economic principles. According to Smith (1956:4), a lack of homogeneity on the demand side of the market may be based on different behaviour, habits, desire for variety, or desire for exclusiveness or differences in user needs.

While the various definitions of market segmentation describe it as a means of homogenising a diverse market (Dibb, 2005:13), it is this process that puts companies in a position to more effectively manage their resources and marketing efforts. The subsequent positive outcomes and returns evident from the market segmentation process therefore provide the rationale for arguing its importance as a critical part of the strategic marketing-management process.

The consequences resulting from the process of market segmentation include aspects, such as a better understanding of the market (Dibb, 1998:394), assistance in the designing of more suitable marketing strategies and programmes (Canever *et al.*, 2007:513; Dibb *et al.*, 2002:113; Quinn *et al.*, 2007:440), helping businesses focus on those buyers that have the greatest chance of being satisfied, as well as identifying new marketing opportunities (Dibb, 2005:14; Quinn *et al.*, 2007:440), and the more effective allocation of financial and other resources (McDonald & Dunbar, 2004:55; Quinn *et al.*, 2007:440).

2.4 THE MARKET SEGMENTATION PROCESS

Marketing practitioners are faced with the challenge of serving an often diverse buyer market. The development of a marketing strategy is, therefore, aimed at designing a marketing mix and marketing actions to serve identified segments (Ferrell & Hartline, 2005:134). Actions, for example, include the choice of brand profile to be offered to the various segments (Mazanec & Strasser, 2000:11), as well as the tailoring of existing services and products.

Mazanec and Strasser (2000:11) are, however, adamant that segmentation and positioning decisions should be interrelated and cannot be optimised independently of each other. These two decisions are strategic in nature and precede action planning for individual marketing instruments, such as designing promotional messages or choosing advertising media and distribution channels (Mazanec & Strasser, 2000:11).

The market segmentation process is described by Noel (2009:113) as a conceptual and analytical process that is critical for developing and implementing effective market strategy. In addition to this, the segmentation process, together with targeting and positioning are regarded by many authors as the essence of strategic marketing (Cant, Strydom, Jooste & Du Plessis, 2006:104). Eight stages are distinguished by Cant *et al.* (2006:104) along the segmentation, targeting and positioning phases. These are listed in Figure 1. A situation analysis provides a basis for identifying the current position, capabilities, objectives and constraints of the business. This stage is followed by market segmentation, which includes identifying those variables needed to segment the market. For each segment a profile is henceforth developed. Next the potential and attractiveness of each segment are evaluated as part of market targeting. Based on this evaluation, a single segment or a number of segments are selected. Product positioning follows and comprises of identifying,

selecting and developing positioning concepts for each target segment. Lastly, a marketing mix strategy is developed.

Figure 1: **Eight stages along the segmentation, targeting and positioning phases (Cant *et al.*, 2006:104)**

Situation Analysis
1. Identify the organisation's current position, capabilities, objectives and constraints

Market segmentation
2. Identify the segmentation variables and segment the market
3. Develop profiles for each segment

Market targeting
4. Evaluate the potential and attractiveness of each segment
5. Select the target segment(s)

Product positioning
6. Identify the positioning concept within each target segment
7. Select and develop the appropriate positioning concepts

Marketing mix
8. Develop the marketing mix strategy

Danneels (1996:36) and Canever *et al.* (2007:511) acknowledge very similar processes as Noel (2009:114). Danneels (1996:36) lists market segmentation as the first step, followed by a decision on which segment or segments to target. Lastly, a suitable marketing strategy must be developed, in order to position the product and service offering of the business in the market. Canever *et al.* (2007:511) remark that current marketing practice first proposes an investigation of the customers' needs, and then segmenting them in groups with similar needs.

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This is followed by the targeting of segment(s) with differentiated products and services.

Quinn *et al.* (2007:445) present segmentation as part of the process linking the market with the product offering and *vice versa*. This process is shown graphically in Figure 2. In order to inform the specific adaptation of product and marketing efforts, the process begins with the identification of the different market segments. This is followed by a review of the profitability of each segment. Volumes of sales, market shares, brand awareness and other relevant indicators can be used as part of this step.

Lastly, those segments judged to be the most attractive – given the effectiveness of the anticipated resource allocation – are targeted.

Figure 2: **A summary of the strategic segmentation process (Quinn *et al.,* 2007:445)**
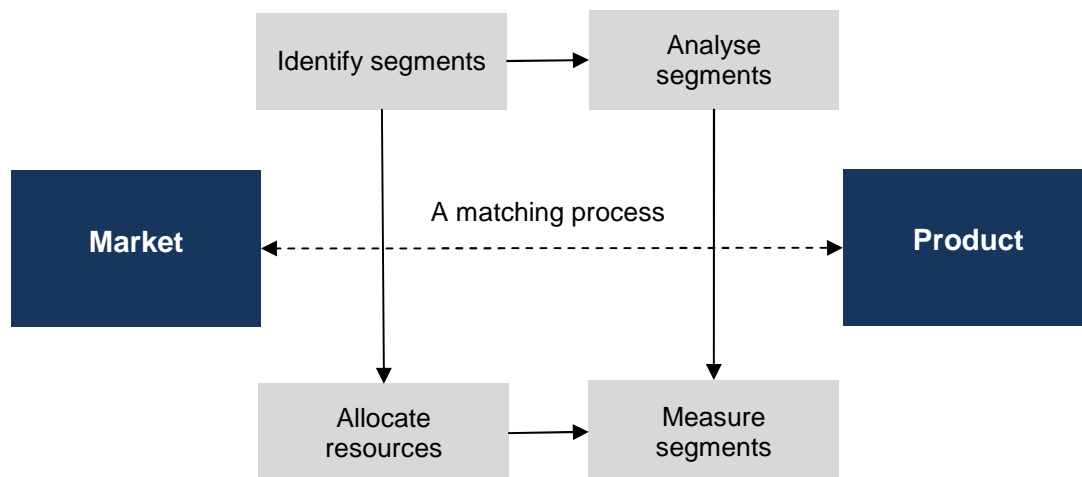
Dibb (2005:14) indicates that segmenting involves the grouping of customers into segments, based on similar needs, wants and characteristics. Targeting involves an evaluation of the relative attraction of the segments, and then deciding where the resources should be allocated. The last step involves the

development of a marketing mix that can meet the needs and requirements of the targeted segments.

Goller *et al.* (2002:254) propose an integrated framework of business segmentation, consisting of four main phases as part of the segmentation process. These phases are: segmentation analysis, evaluation of segmentation, implementation of segmentation, and lastly, the control of segmentation. This process is shown graphically in Figure 3.

Figure 3:   Framework for business segmentation (Goller *et al.*, 2002:254)
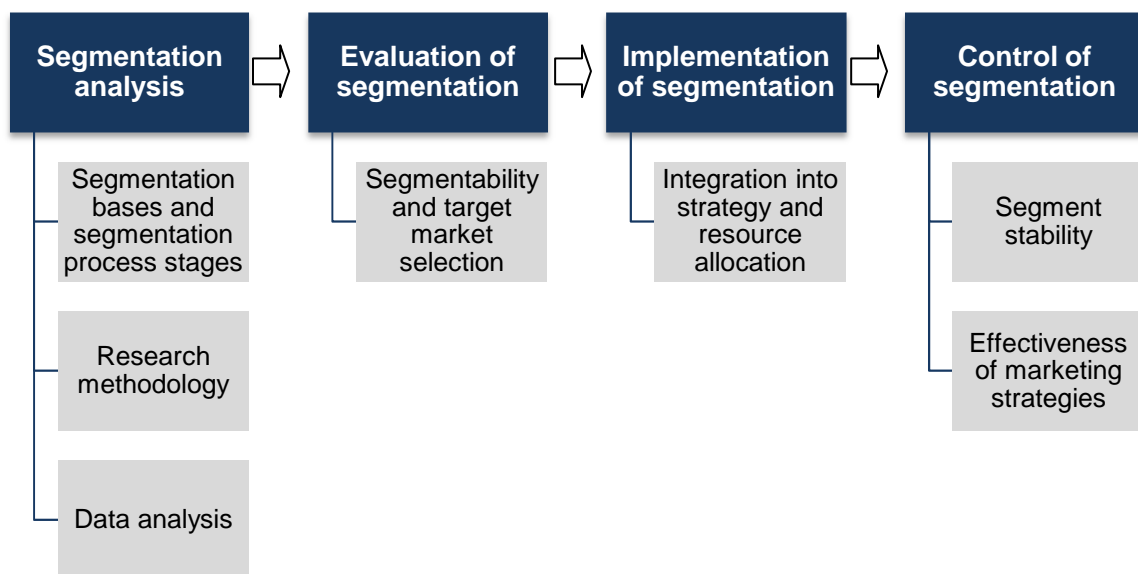
Segmentation analysis consists of all the activities involved in dividing a heterogeneous market into homogeneous sub-markets. The selection of segmentation bases, research methodologies, as well as data analysis plans constitutes important pillars of the segmentation analysis.

The evaluation of the segmentation looks at the effectiveness of the segmentation procedure. Effectiveness is determined against various segmentation criteria, which include measurability, substantiality, accessibility and actionability. These are discussed in more detail in Section 2.6. Target-

market selection criteria are mostly associated with strategy drivers, in other words, key factors that determine the choice of a strategy. These would include: segment size and growth, expected market share, compatibility with the business's objectives, as well as resources.

Goller *et al.* (2002:263) postulate the existence of three levels of implementation of segmentation, namely: the strategic, the managerial, and the operational. Strategic segmentation is concerned with the choice of those industry markets that are compatible with the core competencies of the business. Managerial segmentation is concerned with the identification of sub-industries within markets. Operational segmentation is concerned with the targeting of sub-markets with marketing programmes.

Lastly, Goller *et al.* (2002:264) identified two specific issues relating to the control of segmentation. The first issue deals with the monitoring of segmentation in terms of segment stability, in other words, the degree to which segments remain homogeneous over time on one or more key characteristics that define the segment. And secondly, exerting control by monitoring market effectiveness in the various segments.

McDonald and Dunbar (2004:56) present the process of market segmentation consisting of seven steps. Step one to five deals with the development of segments and is regarded as a first phase of the process. These five steps are furthermore grouped into three stages (stage one to three). Step six and seven deals with prioritising and selecting the correct segments and is regarded as phase two, comprising of only one stage (stage four). The process can be summarised graphically, as shown in Figure 4.

The first phase covers what they refer to as the essential steps that should be followed in developing a segment structure of the market. This applies to the whole market the business operates in and not just that portion of the market in which they are successful. In the first phase, three stages are distinguished.

The first stage involves gaining an understanding of the market, and how it works. Step one in this stage is to define the market; with step two the mapping of the market. The latter step involves presenting the market as a diagram, mapping the flow of cash from the final end-users to the business and its competitors. Once this map is complete, it is then required to determine at which points along it decisions are made about competing products or services, as it is at these points that segmentation should occur.

The second stage comprises one step, namely, to look at the different buyers found at any of the decision-making points on the market map, as well as the transactions they make. This step forces the business to record the key features sought by the market. It is also during this step that information is recorded about buyers, which in turn may be used to identify them in the market.

The third stage consists of two steps: moving from the transactional view of the market to considering the reasons why buyers value certain features over others: in other words, when deciding between alternative offers. Once the actual needs of buyers are understood, their relative value can be assessed. The last step describes the actual techniques required for grouping similar buyers together into segments.

Phase two, namely prioritising and segment selection, can be broken down into two steps. Firstly, the criteria that the business will be using to determine the attraction of each segment are defined. Then, the relative importance of these criteria to each other is established; this is followed by a means of quantifying them. An overall attraction score is subsequently calculated and evaluated against how well the business can service these segments. By combining segment attraction with the relative competence of the business provides a strategic picture of the market, which can then be used for segment selection.

Figure 4: **The seven steps in the market segmentation process (McDonald & Dunbar, 2004:56)**

Stage 1 - Your market and how it works	
Step 1 - Defining the 'market' *(The scope of the project)*	Step 2 - Market mapping *(Structure and decision-makers)*

Stage 2 - Decision-makers and transactions
Step 3 - Who speficies what *(Decision-makers and their purchases)*

Stage 3 - Segmenting the market	
Step 4 - Why *(The needs of decision-makers)*	Step 5 - Forming segments *(Combining like-minded decision-makers)*

Stage 4 - Identifying your target segments	
Step 6 - Segment attractiveness *(Measuring segment potential)*	*Step 7 - Company competitiveness (Company strength by segment)*

However, McDonald and Dunbar (2004:48) advise that a number of factors must be considered by a business before embarking on the stepwise process of market segmentation. The first relates to the degree to which a proposition can be tailored to meet the needs of all the different groups of buyers. This could range from offering a fixed product to one where each buyer is offered a unique product or service. Furthermore, the degree of resource flexibility of the business should also be evaluated. For example, businesses with large fixed/capital assets might be limited in the degree to which they can adjust to market needs, which makes segmentation less operational.

The second consideration relates to the issue of market granularity. This is the degree to which buyers' needs and motivations differ within the defined market. This could range on a continuum from being totally homogeneous on one end of the scale, to being totally heterogeneous on the other end. The potential for market segmentation lies then, according to McDonald and Dunbar (2004:49), in the space between increasing offer flexibility and market granularity. This space is presented in Figure 5.

Figure 5:   Area of potential for market segmentation (McDonald & Dunbar, 2004:49)
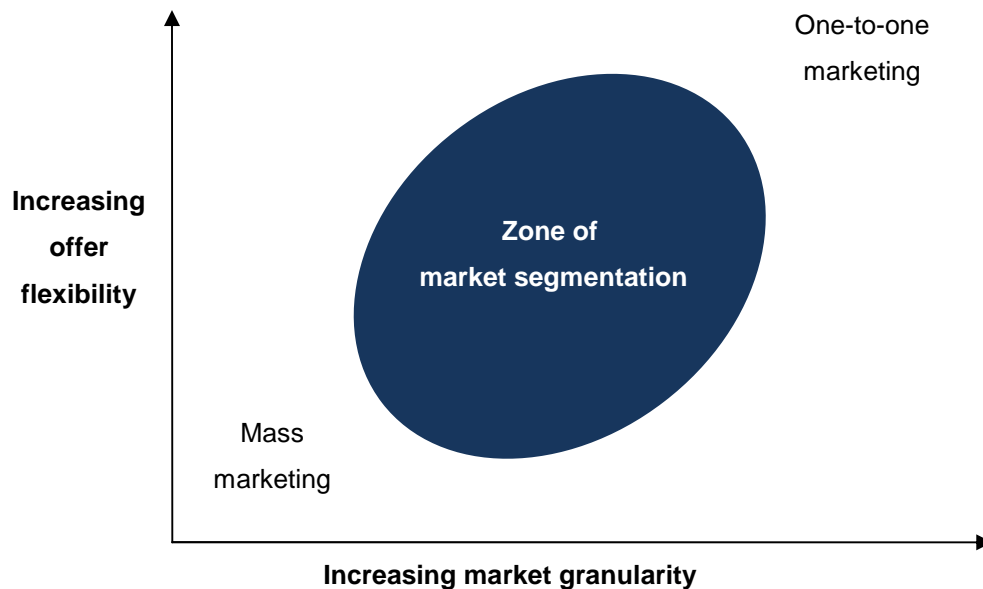
The third and last consideration mentioned by McDonald and Dunbar (2004:49) relates to business factors. These include:

- Geographic location;
- Functions such as, but not limited to, finance, research and development, human resources and marketing;
- Products;
- Markets; and
- Channels.

The business needs to take cognisance of these factors, and to ensure that the business structure is able to accommodate and facilitate market segmentation.

In summary: from the literature, it is therefore evident that various considerations can be identified as part of the segmentation process. These are:

- Defining the aim of performing market segmentation;

- Market definition;

- The selection of segmentation variables (base and descriptors);

- The selection of segmentation approach;

- Determining the research design;

- Identifying the units of analysis;

- Sampling design

- Selecting the data-collection method;

- Segment identification;

- The selection of the target segment; and

- Positioning.

The next sub-sections provide more detailed reflections on these considerations.

2.4.1 Defining the purpose of market segmentation

The first consideration involves clarifying the aims and objectives of performing market segmentation. Yankelovich and Meer (2006:125) postulate that different segmentations are needed for different purposes. According to these authors, one of the common errors that marketers make is applying segmentations designed to address on one kind of issue to some other purpose for which they were not designed. It is therefore important to take cognisance of the questions

asked by management or the decisions they need to make, be it about advertising, product innovation, pricing, choice of distribution channels, and the like. Addressing the specific information needs of management will guide the gathering of relevant data needed for the segmentation exercise. Difficulty also arises when there is a lack of distinction between segmentation for operational and strategic levels and the effect strategic and operational levels have on managers and their efforts to implement the segments (Clarke & Freytag, 2008:1024). These aspects should, where possible, be addressed during the early phases of embarking on market segmentation.

For Sausen, Tomczak and Herrmann (2005:151) the objective of performing market segmentation deals directly with the strategic importance of market segmentation in a business. They regard strategic market segmentation as the intention "...to ensure that the objective of market segmentation is consistent with the firm's overall business and marketing strategy".

At the same time, it ensures that a business's operational capabilities in marketing, sales and market research would be able to fulfil the strategic intention of market segmentation. Therefore, strategic market segmentation could be considered as the glue between the business marketing strategy of the business and the operational segmentation. It should ensure a fit between the segmentation objectives and a business's competencies, facilitating a successful implementation of market segmentation. (Sausen *et al.*, 2005:152). The aim of market segmentation should therefore be to align it with the strategic goals of the business, with a consideration of the availability of resources and skills.

From the literature it is evident that the intention of segmentation can be related to strategy development, to new product and service decisions, or to the existing products and services. The first intention, namely, that of strategy development involves the identification of new target markets. The second intention, namely product and service decisions, pertains to aspects, such as

design, pricing, distribution and advertising. The last intention is concerned with the alteration and adaptation to existing product and service offerings (Sausen *et al.*, 2005:157).

2.4.2 <u>Defining the market</u>

One of the more crucial decisions that marketers face in the crafting of a market segmentation strategy is that of defining the market (Foedermayr & Diamantopoulus, 2008:248). McDonald and Dunbar (2004:74), therefore, advise that a meaningful balance should be struck between a broad and a manageable market definition. A too-narrow definition might restrict the range of new opportunities segmentation could identify, while a too-broad definition might result in overwhelming the segmentation exercise.

Emerging from this, a market should integrate several dimensions, such as buyer needs, buyer groups, competition, products and technologies. It should not simply be viewed in terms of a specific geographical area, product, industry, state-of-action or state-of-mind.

Weinstein (2006:115) also acknowledges the importance of establishing a clear definition of the market. Without a precise definition of the market, segmentation and positioning cannot be adequately implemented. A prerequisite for accurately defining the market is a clear understanding of the markets in which a business competes. In other words, the definition should be meaningful to the business. However, Hamel and Prahalad (in Weinstein, 2006:115) state that it is often difficult to precisely define where an industry begins and ends.

In addition, many untapped opportunities that exist in the market are based on buyer types that have not yet been served, or which have not been clearly articulated.

2.4.3 Selection of segmentation variables

A third consideration, as part of the segmentation process, involves the selection of relevant segmentation bases and descriptors (Lin, 2002:249). Bases are regarded by many researchers as dependent variables, and descriptors as independent variables. These variables guide the grouping of buyers with similar needs and characteristics into segments (Dibb, 2005:13).

The selection of base and descriptor variables is often complicated by the vast array of possible variables available for segmentation purposes (Tonks, 2009:341). This challenge is experienced by many marketing practitioners and researchers when conducting segmentation studies. Another reason is the underlying link between base and descriptor variables. Despite the identification of segments in the market derived from the base variables, descriptor variables do not necessarily contribute further in explaining the reasons for variation in segment behaviour; but they merely provide a profile of segment members. Part of this problem originates with the disjuncture between the strategic goals of the business and the selection of relevant variables to address the goals and objectives of performing a segmentation study (Sausen *et al.*, 2005:157; Yankelovich & Meer 2006:129). This could inhibit the formulation of effective marketing strategies.

Lastly, the availability of business records originating from day-to-day transactional activities or data that has previously been collected internally or externally could provide a platform for the definition and selection of segmentation variables. These data are known as secondary data; and they represent data that were originally collected for some other purpose (Saunders, Lewis & Thornhill, 2009:600), and then serve as identified and incidental sources for segmentation. Tustin, Ligthelm, Martins, and Van Wyk (2005:89) also list public and university libraries, government institutions – such as Statistics South Africa, specialist research institutes like the Unisa Bureau of Market Research, and the Internet – as other sources of secondary data.

However, in some instances, segmentation variables might be operationally defined in such a way that existing secondary sources do not provide relevant data that could be used for the segmentation study. A need therefore exists for the gathering of primary data.

2.4.4 Selection of a segmentation approach

Following a consideration of the aim of market segmentation, having defined the market, and selected the segmentation variables, the approach is now to divide the heterogeneous market into homogeneous sub-markets. From the literature, various approaches are identified. A review of the literature that was undertaken by Canever *et al.* (2007:513) showed that the a-priori scheme and cluster-based segmentation approaches are regarded as two major strategies used in practice. A combination of these two approaches is also widely used. Both the a-priori and cluster-based approach follow a stepwise sequence. The next sub-sections, therefore, reflect more specifically on these two major approaches, as well as on combinations of these two approaches, given that this study, in particular, employed a cluster-based algorithm in facilitating the derivation of the index scores for measuring commercial farming sophistication.

2.4.4.1   *A-priori segmentation*

With this approach, the selection of a base or dependent variable for segmentation is determined in advance (Foedermayr & Diamantopoulus, 2008:252). The number and type of segments are, therefore, also known in advance. The decision is mainly based on judgement, prior experience and/or on an analysis of the secondary data. Such an analysis could include the employment of basic statistical tools for data analysis, such as sorting and cross-tabulation.

Freathy and O'Connell (2000:103) refer to this as selecting base variables on a macro-level, such as geographical location or industry type. This approach can assist marketing practitioners; for example, targeting a specific group of potential buyers or decision-makers. According to Canever *et al.* (2007:513), the advantage of adopting this approach lies in its conceptual simplicity and limited methodological demands (Goller *et al.*, 2002:259). However, a disadvantage is that it often relies on descriptive factors rather than on specifically identifying causality. This, according to Canever *et al.* (2007:513), restricts the predictability with respect to purchasing behaviour.

Wind (1978:321) identified seven steps in the a-priori approach. These steps have much remained relevant in current segmentation studies. The steps are:

(1)   Selection of the (a-priori) basis for segmentation;

(2)   Selection of a set of segment descriptors (including hypotheses on the possible relationships between these descriptors and the basis for the segmentation);

(3)   Design of the sample;

(4)   Data collection;

(5)   Sorting of respondents or sample units into segments;

(6)   Conditional profiling of the segments; and

(7)   The formulation of specific marketing strategies to target the segments.

Specifics on some of these steps are dealt with in more detail in Sections 2.4.5 to 2.4.9.

2.4.4.2   *Cluster-based segmentation*

The cluster-based segmentation approach is a popular method for exploring patterns in particular when dealing with complex populations (Franke, Reisinger & Hoppe, 2009:273). It differs from a-priori models only with respect to the way in which the basis for segmentation is selected. Instead of the a-priori defining of segmentation bases, the number and type of segments are determined post-

hoc, with the formation of clusters of respondents or sample units – based on their similarities on some selected set of variables (Kalafatis & Cheston, 1997:521). Freathy and O'Connell (2000:103) refer to this as the selection of base variables on a micro-level. With regard to its extent of use by researchers and marketing practitioners, it is promoted as the most commonly used method to develop data-driven market segmentation solutions (Dolnicar & Lazarevski, 2009:360).

Foedermayr and Diamantopoulus (2008:252) note that the post-hoc approach can employ two methods of segment formation, namely: descriptive or predictive. Following a descriptive segmentation method, no distinction is made between dependent and independent variables because the aim is to identify the relations between the variables and the units of analysis. For example, this method would involve the grouping of buyers, according to similarities in business operational activities and/or purchasing behaviour.

On the other hand, a predictive method has as its objective the linking of a particular dependent variable to a set of independent variables. For example, linking the frequency of product use to a set of independent variables, such as industry or turnover levels, and then using the latter as segmentation criteria.

Advanced multivariate statistical techniques are often employed to assist in the formation of segments as part of this approach. Multivariate methods deal with the treatment of several variables simultaneously (Wiid & Diggines, 2009:240). Abeyasekera (2005:368) explains that when referring to multivariate techniques as "advanced", this is often associated with requiring a high level of statistical knowledge. The use of these techniques requires various decisions on the selection of a clustering algorithm, and the determination of the number of segments, in particular also if a descriptive or predictive method is used for segment formation. This method of segment formation is, however, in contrast with the views of market segmentation pioneers, as many researchers today acknowledge that data market segments are more often constructed than truly

revealed (Dolnicar & Lazarevski, 2009:361). The reason is that the data are rarely very well structured, which can lead to different segment solutions when changes are made to the clustering algorithm. The more structured the data, the more similar repeated calculations of segmentation solutions with the same numbers of clusters. Dolnicar and Lazarevski (2009:361) therefore note that while the strategy of clustering may be structure-seeking, its operation is one that is structure-imposing. A successful segmentation exercise using cluster analysis therefore lies with recognising when segment groups are a true reflection of the market and not merely imposed on the data by the method.

Nonetheless, cluster-based segmentation is often considered more useful than a-priori segments, due to its ability to more directly reveal the attitudes, perceptions and behaviour portrait by buyers, including individual decision-makers within business and industrial markets (Canever *et al.,* 2007:513; Foedermayr & Diamantopoulus, 2008:252). More specifically, post-hoc predictive techniques allow for both simultaneous prediction and classification. With these advantages, however, comes the disadvantage that it is more difficult to apply (Canever *et al.*, 2007:513), and requires in some cases the collection of primary data, which is methodologically more demanding (Goller *et al.*, 2002:259).

Sections 2.4.5 to 2.4.9 address more specifically some of these considerations.

2.4.4.3 Sequential segmentation method

The combination of an a-priori segmentation approach with cluster-based segmentation models is also an option available to marketing practitioners. For example, buyers can first be grouped-based on the extent of product purchased or usage, in other words, heavy, medium and light users. This would constitute a-priori segmentation. Users within these a-priori formed segments could then be further clustered, based on some other relevant variables, such as brand perceptions.

Despite the conceptual attractiveness, the combination of approaches does require relatively large samples for analytical purposes. As noted in the previous section, the employment of any multivariate advanced statistical analysis in post-hoc segmentation requires various decisions about the selection of a clustering algorithm and the determination of the number of segments.

2.4.5   Determination of the research design

A fifth consideration is that of drafting an appropriate research design for the segmentation study. The formulation of the research design for a segmentation study is informed by the management requirements of the segmentation, the market definition, and the selection of segmentation variables, as well as the adoption of a particular approach. As noted in the previous section, different methodological demands are exerted, depending on the segmentation approach. For example, the use of base variables on a macro-level is considered less demanding, as it is based on judgement, prior experience and/or the analysis of secondary data (Goller *et al.*, 2002:259).

In contrast, following a cluster-based segmentation approach requires mostly the collection of primary data, as well as the employment of advanced multivariate statistical analysis in some instances. This is methodologically more demanding, however.

Saunders *et al.* (2009:136) refer to research design as the general plan of how to go about answering the research questions. In other words, it provides the blueprint for defining the units of analysis, sampling, data collection and the specific segmentation methods that are to be used, including any advanced statistical analysis techniques.

Foedermayr and Diamantopoulus (2008:225) evaluated the research designs employed in selective empirical segmentation studies, which they identified

through a literature study. Nineteen studies were investigated. The research designs included: those that are exploratory in nature, descriptive and explanatory.

Saunders *et al.* (2009:139) describe exploratory studies as a valuable way of seeking new insights or assessing phenomena in a new light. This design, as found by Foedermayr and Diamantopoulus (2008:225), tended towards the gathering of qualitative data by means of in-depth interviews. Saunders *et al.* (2009:140) confirm that the gathering of qualitative data is common practice in this design. Of the 19 studies, eight were found to have employed this design approach.

The great advantage of this design is the flexibility and adaptability that it provides researchers, who must be willing to change direction, as a result of new data that appear and insights that might occur.

Of the 19 studies evaluated, five studies were descriptive by nature. This design was noted in the previous section as being one of the cluster-based segmentation methods, making no distinction between dependent and independent variables. Saunders *et al.* (2009:140) note that the objective of this type of design is to present an accurate profile of persons, events or situations.

Four of the 19 studies were found by Foedermayr and Diamantopoulus (2008:225) to have employed an explanatory design. This design aims to establish and explain causal relationships between the variables (Saunders *et al.*, 2009:140).

For the descriptive and explanatory studies, predominantly quantitative data were gathered by means of structured questionnaires and interviews. The remaining two studies employed a combination of designs and data-gathering methods.

Lastly, when developing a research design, it should also take cognisance of any constraints that might impact on the success of the study when dealing with issues relating to reliability and the validity of the results. This is, in particular, important when the selection of segmentation variables prescribes the employment of empirical research to gather the relevant primary data. Reliability is concerned with the accuracy and precision of a measurement procedure (Cooper & Schindler, 2003:231).

In other words, a measure is considered reliable only if it yields consistent results. A measure that is stable produces consistent results with repeated measurements of the same target population and same instrument. With regard to validity, Cooper and Schindler (2003:231) distinguish between two main forms, namely: external and internal validity.

External validity is concerned with the representativeness and generalisability of the results. This is predominantly addressed by the sampling. Internal validity looks at the ability of a survey instrument to measure what it is supposed to measure.

A review by Foedermayr and Diamantopoulus (2008:246), however, revealed a general lack of validity and reliability assessments in empirical research on segmentation practices. These researchers therefore called for greater attention to be paid to the different types of assessment in future segmentation-research designs. This includes, in particular, addressing content, criterion and construct validity, as well as the assessment of internal consistency.

2.4.6 Identifying units of analysis

Units of analysis refer to those elements that are examined, in order to create summary descriptions of all such units (Babbie, 2011:101). Specification of the units of analysis for segmentation studies should take into account the accessibility, as well as the availability, of information on them or that could be

gathered from them. It is also important that the units of analysis be chosen in accordance with the operational capabilities of a business's marketing, sales, and market research units.

If the marketing practitioner or researcher is unable to gather any relevant data and information from the targeted units of analysis, or from a segmentation perspective, the business cannot serve these units through its operations and marketing activities; the application of market segmentation would inevitably fail.

Babbie (2011:101) also points out that, in some cases, the units of analysis do not coincide with the units of observation. For example, segmentation studies might be concerned with the adoption of information technology in large businesses (unit of analysis); yet the data have been gathered from the chief information officer (unit of observation).

2.4.7 <u>Sampling design</u>

Thompson (2012:1) defines sampling as the process of selecting some part of the population so that one may estimate something about the whole population. This definition accurately captures the essence of sampling in segmentation studies that was envisaged more than 30 years ago, namely: to not merely explain the differences amongst specific respondents or to segment the sample, but to project the results of the study to the relevant universe (Wind, 1978:325).

Important considerations in sampling are those of accuracy and precision; these are fundamental to all good sampling design (Baker, 2002:104). In essence, accuracy and precision deal with reliability; and they refer to freedom from random error, and to the degree to which repeated administration of a sample would lead to comparable results between the samples. In addition to reliability, sampling design must contribute to ensuring the validity of a measurement.

Validity is typically assessed and expressed in terms of the presence or absence of any bias (Baker, 2002:104).

The evaluation by Foedermayr and Diamantopoulus (2008:245) of some selective empirical segmentation studies found that mainly non-probability sampling designs were employed. The non-probability sampling methods ranged from the drawing of a quota, to purposive, judgemental and convenience samples. The major drawback of non-probability sampling methods is that they do not permit statistical evaluation of sampling error. However, they offer significant pragmatic advantages, including being more convenient, as well as less expensive and more accessible than probability methods.

Lastly, sample size should be considered. When employing any advanced multivariate statistical techniques as part of the cluster-based segmentation, sufficient sample size becomes an important factor. However, a balance should be struck between size and cost and time. A too-small sample would result in a lack of statistical power needed to conduct some of the analysis, while a too-large sample might take too long to realise – at a cost disadvantage.

2.4.8 The data collection

As noted, marketing practitioners and researchers have, in the past, relied on both secondary and primary data, as sources for market segmentation studies. The research design should, therefore, make provision for the identification and retrieval of secondary data, or for the collection of primary data, through the relevant research methods. These two data types will be discussed next.

2.4.8.1 Secondary data

Secondary data need to be evaluated in terms of quality, content, usability, presentation and cost (Wiid & Diggines, 2009:77). As secondary data were not collected originally with the aim of using them for segmentation purposes, it is

important to evaluate the quality of such data. Wiid and Diggines (2009:79) list six aspects, which they regard as fundamental to consider when evaluating secondary data, namely:

(1)   Purpose: The data must be evaluated by the researcher and marketing practitioner, in terms of their appropriateness for use.

(2)   Accuracy: The data need to be evaluated in terms of their suitability and applicability to the marketing problem, in other words, when segmenting the market.

(3)   Consistency: Where possible, the researcher must seek multiple sources of the same data, in order to ensure consistency.

(4)   Credibility: The status of the publication and/or reputation of the supplier that originally collected the data should be evaluated.

(5)   Methodology: The researcher should take into account and evaluate the methodology and methods that were employed in the collection of the original data. This includes, amongst other operational definitions used, sampling, measurement and data-collection instruments, as well as the recentness or freshness of the data.

(6)   Bias: The researcher must identify the reasons why the data were originally collected, in order to establish any contextual factors that might impact on the secondary data.

Coyer and Gallo (2005:62) talk about both practical and methodological issues that should be evaluated when a researcher chooses to conduct an analysis of secondary data. Firstly, the investigator must check for the fit between the original data and the new research questions. Secondly, the operational definitions of the variables used in the original study should be applicable and relevant to the requirements of the current study. Thirdly, the original data should be evaluated in terms of sample selection bias.

In addition, the researcher should also take into account any data editing or conversion that need to take place, as preliminaries for getting the data into a

suitable format for further analysis. This should be done without affecting the reliability or the validity of the data.

2.4.8.2 *Primary data*

Various methods may be distinguished that could aid in the collection of primary data, and more specifically quantitative data. One method that is used extensively in the marketing research environment is survey research. Wiid and Diggines (2009:107) note four methods for conducting such surveys, namely: personal interviews, telephone interviews, mail surveys and web-based surveys. It is not the intention of the author to describe each of these methods in detail, as these are adequately covered in most related marketing research textbooks, such as Saunders *et al.* (2009), Tustin *et al.* (2005) and Wiid and Digginess (2009). It should, however, be noted that each offers various advantages and disadvantages. It is the role of the researcher to weigh these in relation to the data needed for the segmentation study. Aspects that should be considered, as in the case of secondary data, include the cost and timing of gathering the data, sampling, reliability and the validity of measurement and data handling.

2.4.9 <u>Segment identification method selection</u>

This aspect deals with the actual formation of market segments. Guidelines for formation indicate that a segment must consist of "an economical minimum number of customers [buyers] to offer an economical value or volume of sales" (Foedermayr & Diamantopoulus, 2008:253). In addition, the number of segments formed must be such that it is manageable. The formation of too many segments could lead to difficulties in terms of inter-segment heterogeneity. In other words, the number of segments is too many and almost too granular. On the other hand, too few segments could lead to a lack of intra-segment homogeneity; in other words, the diversity between the members in a group being too great.

McDonald and Dunbar (2004:57) advise that each segment should be subjected to a "reality check" based on the size of each segment, the differentiation between the offers they require, the business's ability to identify and reach the different buyers found in each segment, and the compatibility of these segments with the business. However, this process takes place without any consideration of a segment's attractiveness (Foedermayr & Diamantopoulus, 2008:253).

The employment of statistical tools to aid in segment identification, and for the determination of membership in market segments ranges from the construction of basic cross-tabulation to advanced multivariate statistical techniques. The following sections describe some of the multivariate statistical techniques that could assist in segment identification. The researcher, however, realises that new statistical methods and tools emerge and evolve constantly and describing all of these would go beyond the scope of this study. The intention is merely to note, through a brief discussion, the value of the contributions that these types of techniques have made in assisting in market segmentation. The application and extent of techniques in practice go far beyond these descriptions.

Some of these techniques directly result in the formation of groups or segments, while others only provide insights into the existence of underlying relations that could be used by researchers and marketing practitioners in market segmentation studies. This suggests the combining of multivariate statistics techniques, as part of segmentation analysis. However, as noted, the use of statistical techniques requires various decisions about the selection of a clustering algorithm, and the determination of the number of segments, as well as the responsibility for these choices. This responsibility would lie with the researcher, the statistician and the marketing practitioner.

2.4.9.1 *Cluster analysis*

Wiid and Digginess (2009:250) describe cluster analysis as a multivariate technique that is used to group similar objects. Everitt, Landau and Leese (in Abeyasekera, 2005:370) describe it as identifying natural groupings among sampling units, for example, respondents, households or businesses, so that units within each group (cluster) are similar to one another, while being dissimilar from any other units, which are to be found in different groups. Alexander *et al.* (2005:113), for example, employed cluster analysis to identify five distinct buyer segments for expendable input purchases for crop and livestock commercial producers in the United States.

The goal of cluster analysis is, therefore, to explore patterns in complex population and to identify homogeneous groups of clusters (Alexander *et al.*, 2005:113; Franke *et al.*, 2009:273). Key considerations, therefore, include the selection of variables that could serve as a basis for cluster formation, the number of variables, the measurement level of data, as well as the criteria for combining cases into clusters. Dolnicar and Lazarevski (2009:359) noted specifically the challenge associated with having too many variables in the segmentation base, given the sample size. A common approach that researchers have used to address this challenge is to first subject the variables to an exploratory factor analysis or principal component analysis as a data reduction technique, before clustering the resulting factor scores. A potential disadvantage of this approach is when the factor analytical solution explains a very low percentage of the variance in the raw data. Consequently, a large proportion of the information contained in the data is essentially discarded. Optimally, researchers should measure only a small number of conceptually well-developed items from the start.

2.4.9.2   Classification trees

A classification tree procedure classifies objects into groups, based on the values of independent or predictor variables (SPSS, 2007:1). This technique is, therefore, based on the specifications of a dependent variable, as well those variables that would serve as a basis for classification. This technique is particularly suited for segmentation studies.

One of the methods most often employed in classification trees is CHAID (Chi-squared Automatic Interaction Detector). With CHAID, each independent variable is split into smaller subgroups – until no more significant independent variables (predictors) can be found. The segments that are derived from CHAID consist of uniquely classified members; and therefore, they do not overlap. Each case can be classified into its appropriate segment by knowing the categories of these predictors.

2.4.9.3   Discriminant analysis

Discriminant analysis provides classification rules that enable two or more groups of objects to be separated (Abeyasekera, 2005:370). It is a dependent variable technique, where initial group membership is known. The practical value of this technique from a segmentation perspective lies with the identification of those variables that contribute the most to explaining variation between the groups.

This provides insight and direction in the selection of segmentation bases, particularly when following a sequential segmentation approach. Secondly, the results from the analysis produce a statistical function indicating the linear combinations of the independent, or predictor, variables that could serve as the basis for classifying unknown cases into one of the groups (Leech, Barrett & Morgan, 2005:132). This could then be used in further procedures – to form groups or segments of cases.

2.4.9.4   Logistic regression

Similar to discriminant analysis, logistic regression provides rules for classifying objects into predefined groups. However, discriminant analysis is preferred when the dependent variable has three or more groups; whereas logistic regression is used when the dependent variable has only two possible values (Pallant, 2010:168). In addition, logistic regression requires far fewer assumptions than does discriminant analysis.

The value of this technique for segmentation purposes, as with discriminant analysis, lies with the identification of those variables that contribute most to explaining the variation between the dichotomous groups, as well as enabling researchers to classify unknown cases into one of the groups.

2.4.9.5   Multidimensional scaling

This technique is a method for measuring the relationship between objects in a multidimensional space (Wiid & Digginess, 2009:251). In survey research it is often applied on the basis of the respondents' corresponding opinions, perceptions or attitudes regarding the objects.

The purpose of multidimensional scaling is to construct a map of the location of objects relative to each other from the data that specify how different the objects are.

Although this technique does not directly result in the formation of homogeneous groups, based on the measured similarity (or dissimilarity) of objects, the findings could assist researchers and marketing practitioners to identify the existence of significant relationships that could inform market segmentation. As with cluster analysis, this is a technique that does not rely on specifying any dependent variables. Key considerations, therefore, include the

selection of variables, the measurement level of data, and the algorithm for identifying similarity (or dissimilarity) amongst objects.

2.4.9.6 *A note on the use of multivariate statistical analysis techniques*

The widespread availability of statistical software makes multivariate analysis more accessible to most managers and marketing practitioners, but many lack the capacity and knowledge to deal with the complexities of statistical analysis (Dibb, 1998:397). When planning, market segmentation and multivariate statistical techniques are to be considered as part of the process. The segmentation team should be aware of the pitfalls associated with its inappropriate use in guiding the identification of segments.

This is particularly important when choosing segmentation variables and bases to be used in the multivariate statistical analyses, since it is a fairly subjective process (Tonks, 2009:342) directed largely by the marketing practitioner in collaboration with the researcher and the statistician. Wedel and Kamakura (in Quinn *et al.,* 2007:443) offer an important reminder in this regard, stating that "...every [segmentation] model is at best an approximation of reality. One cannot claim that segments really exist, or that the distributional form of unobserved heterogeneity is known."

This point is often overlooked in the literature, according to Wedel and Kamakura (in Quinn *et al.,* 2007:443), as identified market segments are not necessarily homogeneous groupings of customers naturally occurring in the marketplace, but rather the outcome imposed by a multivariate statistical technique that inform segment formation. This relates to the challenge of structure-seeking versus structure-imposing. This aspect was noted in Section 2.4.4.2. Marketing practitioners should, therefore, never rely exclusively on tools, such as multivariate statistical techniques to inform the identification of segments, but should take cognisance of their knowledge of the market.

Another major challenge that should be noted when using multivariate techniques is the lack of creating similar segment solutions when using a new set of data, despite having been collected from a similar target population. The reason is, as already noted in the previous sections, that these techniques rely on certain algorithms as part of statistical computations, and changes in either the algorithms or raw data can lead to different segment solutions. The challenge of presenting, for example, a method that allows researchers and marketing practitioners to calculate and present an index that can be applied in repeated segmentation studies is addressed in this study.

2.4.10 <u>Target segment selection</u>

Following the identification of segments, the relative attraction of each segment must be determined (Dibb, 2005:13), together with the subsequent selection of segment(s) to target. This should be done with consideration of the available resources, skills and capabilities of the business (Freathy & O'Connell, 2000:103). The evaluation of the strengths and weaknesses is a crucial step in the process.

While a marketing opportunity might be identified with a particular segment, without the necessary strengths, resources and skills, such an opportunity cannot be pursued.

Goller *et al.* (2002:261) list a number of factors identified from a review of the strategic management literature, as suggested criteria for target segment selection. These factors include segment size and growth, expected market shares, compatibility with the objectives and resources of the business, as well as structural segment attraction. They also mention the evaluation of business capabilities *vis-à-vis* competitors, as being an important criterion, in order to assess whether competitive advantage can be achieved in potential target segments.

Foedermayr and Diamantopoulus (2008:255) similarly note seven criteria that are often used by US managers to evaluate and select target segments, namely: segment size, compatibility with the objectives and resources of the business, profitability, growth expectations, the ability to reach buyers in the segment, the competitive position of the business in the segment, in addition to the cost of reaching the buyers.

2.4.11 Positioning

The last step in the process involves product and service positioning (Dibb, 2005:13). It is also at this step that a precise adjustment of product and marketing mix programmes needs to be made. The profitability of segments can further guide adjustments and the success of the segmentation process (Quinn *et al.*, 2007:445). This step Danneels (1996:36) referred to as the implementation phase of the segmentation process.

It is within the context of this step that concerns have been raised in the literature of a theory/practice divide in market segmentation. The various concerns will be addressed in more detail in Section 2.7.3, but it is important to briefly acknowledge them here. The two main arguments and reasons for this divide emerge from the literature. The first argument relates to the practical difficulties in implementing segmentation approaches; and secondly, the often limited explanatory value offered from traditional segmentation bases.

These two problems largely manifest during the positioning phase of the segmentation process. Various possible impediments to the implementation process can be identified, including underlying problems in a business's infrastructure, the mechanics of the segmentation process, as well as the incorrect handling of the implementation phase (Dibb, 2005:14). While these are serious concerns that warrant further research and attention, they fall outside the scope of this study.

2.5   THE PURPOSE AND ANTECEDENTS OF MARKET SEGMENTATION

The purpose and benefits of market segmentation have been extensively debated in the literature (Dibb, 2005:13; Freathy & O'Connell, 2000:102). The sub-sections that follow review some of the purposes and resultant antecedents noted in the literature.

2.5.1   <u>Homogenising market heterogeneity</u>

McDonald and Dunbar (2004:29) rightfully state that the central idea of marketing is to match the needs and wants of buyers to the competences of the business, in such a way as to accomplish the goals of both parties. This is, however, not an easy task.

As a result of an increase in the diversity of markets, it has become impossible for many businesses, such as agricultural input suppliers and service providers, to follow a mass marketing approach. Goller *et al.* (2002:256) argue that for many markets this is particularly true, as the application of products can vary considerably amongst users, meaning that buyers could seek different product benefits. By employing market segmentation, these businesses can cope with this heterogeneity by grouping buyers, like commercial farming businesses, with similar needs and characteristics together into several homogeneous sub-markets (Dibb, 2005:13; Canever *et al.*, 2007:511; Ferrell & Hartline, 2005:135; Lin, 2002:249).

Freathy and O'Connell (2000:102) similarly argue that owing to the increasing introduction of products to the market, businesses are, furthermore, challenged by variations in buyer characteristics and the growing fragmentation of advertising media. Segmentation is then frequently used as a method of categorising buyers into discrete and manageable classifications. The aim is,

therefore, to identify groups where the members have similar likes, tastes, needs, wants, preferences or behaviour, but where the groups themselves are dissimilar from each other (Ferrell & Hartline, 2005:135). Decisions about which segments are most attractive for the business can now be made (Canever *et al.*, 2007:511), thereby making the best use of finite resources (Freathy & O'Connell, 2000:102; Goller *et al.*, 2002:256).

Furthermore, group members that have been segmented, according to similar likes, tastes, needs, wants, preferences or behaviour would tend to demonstrate a more homogeneous response to marketing programmes (Dibb *et al.*, 2002:113). Segments can be targeted – with marketers expecting them to demonstrate a more homogeneous response to marketing programmes. Marketers can formulate product strategies, or product positions, tailored specifically to the demands of these homogeneous sub-markets (Goller *et al.*, 2002:266; Lin, 2002:249).

2.5.2 Improved understanding of buyers

One of the abiding principles of sound business practice is to know the buyer market of your products and services (McDonald & Dunbar, 2004:xi). Marketers, therefore, use segmentation to more precisely define and understand buyers' needs and wants (Dibb *et al.*, 2002:113; Ferrell & Hartline, 2005:134; Sausen *et al.*, 2005:157).

Smith (1956:7), for example, argued more than half a century ago that the exploitation of market segments provides for greater maximisation of buyer or user satisfactions; and this tends to build a more secure market position and leads to greater over-all stability.

Segmentation, therefore, allows marketers to tailor products and services to better suit market needs (Dibb *et al.*, 2002:113; Canever *et al.*, 2007:513), thereby leading to more suitable marketing programmes and enhanced

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marketing effectiveness (Foedermayr & Diamantopoulus, 2008:223; Rotfeld, 2007:333). This again might lead to an increase in member satisfaction and brand loyalty (Dibb, 2005:13). It also leads to an understanding of the competitive environment and fewer direct confrontations with competitors (Dibb *et al.*, 2002:113).

Lastly, as a result of being grouped together, according to similar buying needs and behaviours, buyers tend to demonstrate a more homogeneous response to marketing programmes, thereby assisting the predictive capabilities of marketing (Freathy & O'Connell, 2000:102; Rotfeld, 2007:332).

2.5.3 <u>The identification of new opportunities</u>

Dibb *et al.* (2002:113) postulate that market segmentation improves marketing practitioners' ability to identify marketing opportunities. This notion was also acknowledged by Canever *et al.* (2007:513). These authors stated that segmentation and targeting have been shown to improve the sellers' capacity to identify market opportunities. Dibb (2005:13) adds that segmentation might also lead to gaining valuable insight into competitor behaviour and market position, which could then be used in building and sustaining a differential advantage.

2.5.4 <u>The allocation of resources</u>

Wind (1978:317) acknowledged some 30 years ago that market segmentation plays a guiding role in strategic marketing planning and resource allocation. Hooley, Greenley, Cadogan and Fahy (2005:19) make reference to marketing resources as comprising any resources that create value in the market place. Marketing resources are, therefore, defined as any attribute, tangible or intangible, physical or human, intellectual or relational, that can be deployed by the business to achieve a competitive advantage in the marketplace.

Hooley *et al.* (2005:19) make a further distinction between market-based resources and marketing-support resources. Market-based resources are those resources that can be immediately deployed in the market place to directly create or maintain a competitive advantage. Marketing support resources, on the other hand, serve primarily to support marketing activities, and hence contribute indirectly to the competitive advantage.

Four main sets constitute market-based resources. Firstly, there are the customer-linking capabilities of the business, and these would include the ability to identify the wants and requirements of buyers, together with the capabilities to create and build appropriate relationships with them. A second set of market-based resources encapsulate the reputation and credibility of the business among its buyers, customers, suppliers, and distributors. Hooley *et al.* (2005:19) term these as reputational assets.

A third set of resources is the ability to successfully innovate in the marketplace. The last set of market-based resources is the human resources of the business.

Marketing support resources are made up of the marketing culture of the business and the capabilities of its managers to lead, manage, motivate, and coordinate activities. Hooley *et al.* (2005:20) link managerial capabilities to areas, such as human-resource management, operation management and financial management.

The principle of market segmentation is, therefore, that because of limited resources and skills, businesses cannot service all buyers in a diverse market. Segmentation, therefore, helps businesses to match their limited resources and strategies to the buyers' needs and wants (Canever *et al.*, 2007:512). This antecedent of market segmentation was also acknowledged by researchers, such as Dibb *et al.* (2002:113), Freathy and O'Connell (2000:102) and Goller *et al.* (2002:263).

By focusing the business's limited resources on the most attractive segments, segmentation encourages businesses to play to their strengths (Dibb *et al.*, 2002:113). When referring to resources, Goller *et al.* (2002:263) also note that segmentation aids in establishing guidelines for more effective resource allocation, not only among products, but also among markets.

2.5.5 <u>Improved business performance and competitive advantage</u>

It is postulated that market segmentation aids businesses in meeting the demands of buyers, the building of a more secure market position, which ultimately leads to greater overall stability, improved performance and competitive advantage (Dibb, 2002:114; Freathy & O'Connell, 2000:102; Goller *et al.*, 2002:266). The demand of buyers is, for example, addressed through the marketing mix (Goller *et al.*, 2002:266). Goller *et al.* (2002:266) note that once a target market has been chosen, the marketing mix must be developed and tailored with the aim of creating a sustainable competitive advantage.

Dibb (2005:13) referred to the "analytical process involved in achieving these ends encourages organisations to emphasise [their] competitive strengths and to be customer focused". She further postulated that the chance of developing suitable products and marketing programmes is thereby enhanced, with the potential of increasing satisfaction and brand loyalty. However, market segmentation serves as a means for improving business performance and achieving competitive advantage, rather than as an outcome in itself. In other words, market segmentation serves as a moderating effect.

2.6 THE KEY SUCCESS FACTORS OF MARKET SEGMENTATION

The effectiveness of market segmentation is regarded as crucial in creating buyer value and a competitive advantage (Canever *et al.*, 2007:514). Contributing factors attributed to effective market segmentation include having

clear segmentation objectives, senior-level commitment and a well-designed plan (Dibb, 2005:15). In the literature, reference is also commonly made to eight criteria for market segmentation, in order to be regarded as successful (Canever *et al.*, 2007:514; Ferrell & Hartline, 2005:142; Freathy & O'Connell, 2000:102; Goller *et al.*, 2002:261; Lin, 2002:250).

These criteria are: segmentability, measurability, accessibility, substantiality, sustainability, actionability, responsiveness and stability.

2.6.1 <u>Segmentability</u>

The first criterion refers to segmentability or identifiability. Successful segmentation can only take place if buyers can be grouped together, based on particular criteria. In other words, segmentation must lead to homogeneity within and heterogeneity between the various segments (Goller *et al.*, 2002:261). Furthermore, the characteristics of the segment's members should be easily identifiable (Lin, 2002:250). The key to meeting this criterion is the careful selection of bases for market segmentation. That is, identifying the variables whereby the market is to be segmented, as well as those variables that will be used as descriptors.

A good market segmentation research study should, therefore, provide operational data that Woo (1998:418) describes as practical, usable and readily translatable into strategy.

Goller *et al.* (2002:261) claim that only four aspects actually point toward segmentability criteria, namely homogeneity within, heterogeneity between, measurability and accessibility. They support their argument by stating that these four aspects are the only ones that actually screen segmentation schemes for usefulness and relevance. However, these aspects do not inform the choice of marketing strategy itself. As such, Goller *et al.* (2002:261) assert that marketing practitioners regard segmentability criteria as a step in the

evaluation process prior to assessing segments further by means of target-market evaluation.

2.6.2 Measurability

The second criterion, measurability, refers to the degree that the size, purchasing power and profits of a market segment can be identified (Canever *et al.*, 2007:514; Freathy & O'Connell, 2000:103).

2.6.3 Accessibility

The third criterion states that segments should be accessible in terms of communication and distributional efforts (Canever *et al.*, 2007:514; Ferrell & Hartline, 2005:142). Freathy and O'Connell (2000:103) emphasised that a segment is only accessible if it can be served in a cost-effective manner.

2.6.4 Substantiality

Substantiality is the degree to which a segment is considered sufficiently large to warrant the cost of a targeted-market programme (Canever *et al.*, 2007:514; Freathy & O'Connell, 2000:103). The potential for profit should, therefore, exceed the cost involved in developing a specific marketing mix for the segment (Ferrell & Hartline, 2005:142).

2.6.5 Actionability

The fifth criterion, actionability, refers to the internal capability of the business to effectively target its chosen segment within its own financial and structural resource constraints, on the one hand, and the values and culture of the business, on the other hand (Canever *et al.*, 2007:514; Freathy & O'Connell, 2000:103). Both Foedermayr and Diamantopoulus (2008:254), as well as Goller

et al. (2002:261) assert it as essential that a sustained and competitive differentiation can be attained within a target segment.

2.6.6 Responsiveness

Responsiveness considers the degree to which a segment is responsive to marketing efforts, including changes to the marketing mix over time (Ferrell & Hartline, 2005:142). This means that members of a segment must be willing, ready and able to engage in exchange transactions. At the same time, segments should potentially respond differently to marketing communication.

2.6.7 Stability

The last criterion, stability, is a judgement of the extent to which a market segment is durable enough to justify the investment in targeted marketing programmes (Canever *et al.*, 2007:514). A stable segment also contributes to more reliable behavioural predictions over time (Van Raaij & Verhallen, 1994:49).

2.7   WHAT A MARKET SEGMENTATION LOGIC OFFERS MARKETING THEORY

The next sections consider, firstly, the importance of theory for researchers and practitioners. However, concerns have been raised about a theory/practice divide within marketing, which also relates to market segmentation. These aspects are discussed in relation to the essence of market segmentation.

2.7.1 The importance of theory

Theory is considered important for both researchers and practitioners, for three reasons (Wacker, 1998:361). Firstly, theory provides a framework for analysis.

In other words, elements relating to the definition of terms of variables, the exact settings or circumstances where the theory can be applied, the set of relationships and the specific predictions or factual claims that emerge from the theory are described. This provides points of reference for cases where differences in opinion exists amongst scholars, theorists and practitioners.

Secondly, theory provides an efficient method for field development. While a theory can never be proven right (Borgatti, 2005:1), since it is impossible to conduct all the necessary tests to verify the theory, the actual testing of a theory provides opportunity to build upon what is already known. Borgatti (2005:1) describes this process as equivalent to incorporating all that is known from the current literature: theoretical, mathematical, empirical, and practitioner research into a single, integrated consistent body of knowledge.

This provides researchers and practitioners with a deeper theoretical meaning, allowing them to differentiate between competing theories.

Thirdly, theory provides clear explanations for the pragmatic world. In other words, the value we gain from a practical point of view in terms of assisting in making predictions and interpreting the present in understanding what is happening and why (Christensen & Raynor, 2003:68).

Despite the value of theory in explaining and predicting behaviour and phenomena, a review of the literature reveals concerns about the slow progress of theory development in the marketing domain. This leads to a theory/practice divide (Burton, 2005:5). In fact, this concern is, however, not new and was noted by Wind (1978:317) more than 30 years ago, when he acknowledged the discrepancy between academic developments and real-world practice.

One of the main questions, therefore, asked in the renewed focus on marketing theory, is: What does marketing offer? – both academically as well as from a practitioner's point of view (Sausen *et al*., 2005:151).

2.7.2 <u>The theory/practice divide in marketing</u>

Cornelissen (2002: 133) remarks that the relationship between academia, the conduct of scientific research, and the professional fields of practice has continuously been a subject of debate. Cornelissen (2002:134) cites Holbrook, who argued that academic and practitioner orientations to marketing problems are fundamentally distinct, and should for that matter remain separate. Jacoby (1985) replied to Holbrook, stating that although there are general differences in the orientation of academics and practitioners, these orientations should be seen as complementary, rather than competitive or mutually exclusive.

The theory/practice divide stems from the general premise that, on the one hand, marketing practitioners tends to engage in marketing research for more pragmatic reasons. The focus falls on addressing a single problem under investigation – with the aim of designing action strategies for dealing with it. In other words, trying to develop low-level theories based on empirical generalisations. They, therefore, often find themselves less concerned with adding to the theoretical body of knowledge and substantive marketing theory (Cornelissen, 2002:134).

On the other hand, an academic researcher "sacrifices a detailed description and analysis of the features of the phenomenon, in order to illustrate the relations among the concepts (rather than to provide a comprehensive understanding of the phenomenon), while the practitioner focuses on a single problem under study, with the purpose of designing strategies and courses of action for dealing with it" (Cornelissen, 2002:135).

In focusing on developing grand theories, academics thus aim to capture observed reality in a more general sense, rather than providing a full and comprehensive description of a particular phenomenon.

As a result of the different focus areas, marketing practitioners tend to ignore the research findings published in academic journals, primarily due to the fact that the formulation of these theories occurs at such a high level of generality that they provide little similarity to the day-to-day marketing challenges faced by managers. In this duality, the theory/practice divide manifests itself.

2.7.3   Concerns of a theory/practice divide in market segmentation

Concerns of a theory/practice divide are also raised in the market segmentation literature. Dibb and Simkin (2009:219) talk about the existence of a tension between theory and practice. This tension continuously shapes and influence research priorities for the field. Questions about effectiveness and productivity, however, remain, namely: (i) concerns about the link between segmentation and performance, and its measurement; and (ii) the notion that productivity improvements arising from segmentation are only achievable if the segmentation process is effectively implemented.

Kalafatis and Cheston (1997:520) described the theory/practice divide as having, on the one hand, deviations between theoretical concepts, while, on the other hand, having applications of market segmentation in 'real world' situations. Two main arguments and reasons for this divide emerge from the literature. The first relates to the practical difficulties in implementing segmentation approaches; and secondly, to the often-limited explanatory value offered from traditional segmentation bases.

These concerns are to be more broadly discussed in the following sections.

2.7.3.1 *Difficulties in the practical implementation of market segmentation*

Dibb (2005:14) ascribes the theory/practice divide to the difficulties often experienced by businesses in implementing segmentation approaches. In earlier published work of Dibb (1999:108), the author also argued that much of the research literature focuses on the selection of base variables and on the validation of segmentation output, rather than on the more practical implementation issues experienced by marketing practitioners. Freathy and O'Connell (2000:103) argue along similar lines that much of the work in segmentation has focused on the various methods and techniques used in the process, rather than on the evaluation and selection of coherent market segments.

As a result, marketing practitioners having conducted segmentation studies that fail to generate usable segmentation solutions.

Dibb (2005:14) cites, from the literature, various impediments of the implementation process, including the underlying problems in a business's infrastructure, the mechanics of the segmentation process, as well as the incorrect handling of the implementation phase. Dibb (2005:14) goes further and categorises these impediments into two groups, namely: hard or tangible, and soft or intangible. These barriers emerge at the outset of the process, and are referred to as infrastructure barriers; during the segmentation analysis, they are referred to as process barriers; and after any segments have been determined, they are referred to as implementation barriers.

While hard or tangible issues refer to data, financial, human resource and time resource constraints, soft or intangible issues are linked with the business culture, inter-functional coordination and leadership style.

Dibb (2005:14) stresses the importance of overcoming these impediments, since they are critical to the success of the segmentation process. This is ultimately so, when homogeneous customer segments for which suitable marketing programmes could be developed, can be identified.

Sausen *et al.* (2005:152), citing Dibb *et al.*, find the reason for the failure of implementation in the lack of strategic embedding at corporate level. Contributing further to the problem are shortfalls in operational capabilities in marketing, sales, and market research.

Lastly, Foedermayr and Diamantopoulus (2008:224) make a very important observation that the researcher believes largely underlies the concerns of marketing practitioners in moving from market segmentation to implementation. According to Foedermayr and Diamantopoulus (2008:224), most literature on the topic of market segmentation has been conceptual or normative in nature, dealing with how market segmentation should be conducted, rather than with how segmentation is actually performed in practice.

This is despite the general acknowledgement of the importance of market segmentation for the general success of a business. The researchers also note that it is evident that previous literature reviews have dealt more with the choice of segmentation variables and bases at the expense of other stages of the segmentation process, such as market definition, segment formation and evaluation.

2.7.3.2 Offering of limited explanatory value

Another aspect raised in the literature relating to market segmentation problems is that of the often very limited explanatory value offered by traditional demographic variables (such as gender, age, income, educational level and socio-economic status) and firmographic variables (such as size, turnover and geographic area) in explaining the reasons and motivations behind buying

behaviour. These also contribute to the difficulties in the practical implementation of market segmentation approaches.

El-Adly (2007:938), for example, remarks that some market segmentation studies, in particular those that have adopted an a-priori approach, would typically use the traditional external characteristics of buyers, like turnover, size and geographical location in business markets and gender, age and social class in consumer markets, to describe the differences between segments' behaviour. However, these external variables are not necessarily determinants of buying behaviour; and they usually provide little assistance to marketers in formulating marketing strategies.

Hollywood, Armstrong and Durkin (2007:691) share similar sentiments on the value of these types of traditional external variables in explaining buyer behaviour. They note that while a market segmentation exercise provides opportunity for marketers to better understand core consumers, traditional variables, such as geographics and demographics/firmographics no longer provide enough insight into how these buyers actually make their decisions.

Van Raaij and Verhallen (1994:52) not only single out the traditional external variables mentioned above; but they also include personality types as poor predictors of consumer behaviour. They mention the work of another researcher, Kassarjian, who postulated that only about two to five per cent, and at most 10 per cent of behavioural differences in consumers can be explained on the basis of general personality types.

Quinn (2009:254) raises similar concerns about consumer lifestyles as explanatory variables in segmentation studies. These researchers offer some explanation for this, postulating that as consumer lifestyles become increasingly fragmented, market segmentation studies using this as a base variable become less effective and efficient.

Powers and Sterling (2008:170) acknowledge the challenge faced by marketing practitioners to identify varied buyer needs, in order to build value segments. However, they argue that despite being able to identify the characteristics of buyers, the actual needs of these buyers cannot necessarily be deduced from these facts.

Lin (2002:249) also argued that traditional external variables cannot identify the complete characteristics of the various sub-markets targeted. For example, consumers in the same demographics group have varied psychographic make-ups. Psychographic research studies the lifestyles and personalities of consumers, and according to Lin (2002:250), products are the basic building blocks that describe a particular lifestyle. Consumers, therefore, define their lifestyles by the purchasing and consumption choices they make across available product and service categories.

The defining, quantification and subsequent understanding of this behaviour provides the foundation for market segmentation. But, despite Lin's (2002:250) strong argument that lifestyle and personality variables are effective segmentation variables for identifying sub-market profiles and targeting consumers, subsequent concerns were raised by Yankelovich and Meer (2006:124) about the actual explanatory value that this approach offers. Yankelovich and Meer (2006:124) observed that while psychographics go beyond mere demographics, and may capture some truth about real people's lifestyles, attitudes, self-image, and aspirations, this science is weak when predicting purchasing behaviour.

As in consumer segmentation studies, concerns have also been raised on the explanatory value of firmographics in explaining buying behaviour in business markets. Quinn *et al.* (2007:443) note the common use of descriptor variables, such as industry type, location and size in industrial segmentation studies. The reasons for the use of these variables lie in their clarity, convenience and ease

of implementation. However, they do not necessarily provide insight into buying behaviour.

In conclusion, and having considered the various views from the literature, it would seem that the value of demographics and firmographic variables in segmentation studies lies largely in their descriptive capabilities. In other words, these variables provide information on the selective characteristics of consumers in a particular segment of the market. From a statistical perspective, they might even explain some variation that is evident in measured levels of buying behaviour. However, explaining behaviour from a purely statistical perspective does not necessarily provide insight into the reasons or motivations for buying or consumption; and they, therefore, provide only limited value to marketers in the formulation of marketing strategies.

This sentiment was already raised by Sharma and Lambert some 18 years ago. Sharma and Lambert (in Woo, 1998:418) noted that demographic variables pose two problems in market segmentation studies. "The first one is that the demographic profile is assumed to reflect consumption patterns. Another problem is in implementing segmentation strategies. This can be illustrated by the fact that segmentation based on age variables and gender variables does not suggest how the marketing strategies should be formulated."

2.7.4 <u>The essence of market segmentation</u>

It is, consequently, evident that while traditional demographic and firmographic variables can be used to explain the characteristics of the sub-markets and to classify the key factors of a market segment, they cannot identify the complete characteristics of the sub-markets. Members of a business segment may, for example, all purchase a certain product brand, and although being very homogeneous in their firmographics, these businesses might purchase the brand for different reasons, and as such, they would be very heterogeneous in their operational requirements.

In consumer markets, general personality characteristics are considered by many practitioners as being ill-suited to clearly explain specific behavioural differences (Van Raaij & Verhallen, 1994:52). Segmentation based on any of these variables alone is inadequate in providing clear guidance on how marketing strategies should be formulated (Woo, 1998:418). Similarly, some general firmographic characteristics might not be explanatory in terms of the purchasing behaviour of business.

Alternative directions in segmentation research have, for example, explored the effectiveness of segmenting markets based on the needs and/or benefits sought by the buyer (Woo, 1998:418). The underlying benefit of this approach is to enable a service provider to implement different marketing strategies for different segments – by offering unique benefits sought by the members of each market segment.

Identifying new bases for market segmentation, therefore, remains an important point on the development agenda of the business. Tonks (2009:342) acknowledges that choosing segmentation bases is a fairly subjective process, and it is rarely possible to assert categorically that there is only one best way to segment a particular market.

Despite the fact then that market segmentation remains a well-documented and commonly used method of targeting buyer groups (Ferrell & Hartline, 2005:135; Freathy & O'Connell, 2000:102), the question could well be posed: What does a segmentation logic offer marketing theory? From a theoretical and normative point of view then, market segmentation derives directly from the marketing concept (Tonks, 2009:342). Marketing theory stipulates that a market segmentation approach being adopted by a business should enhance its performance (Ferrell & Hartline, 2005:134; Freathy & O'Connel, 2000:102; Goller *et al.*, 2002:263; McDonald & Dunbar, 2004:34; Wensley, 2002:113).

Freathy *et al.* (2000:102), however, noted that despite the suggestion that pursuing a segmentation approach should enhance a business's performance, and the notion of competitive advantage, there appears to be little practical advice as to how this result could be achieved. The essence of market segmentation lies, therefore, in the notion that it has a moderating effect on performance, rather than having any direct effect (Dibb *et al.*, 2002:114; Quinn *et al.*, 2007:444).

The assertion of market segmentation is, therefore, regarded as basic in its rational, namely: to divide a diverse market into several homogeneous sub-markets (Lin, 2002:249) based on similar needs and buying behaviour, and which would be likely to respond very similarly to a particular marketing programme (Dibb, 1999:108). If properly applied, it should also guide marketing practitioners in tailoring product and service offerings to the groups that are most likely to purchase them (Yankelovich & Meer, 2006:122).

This notion forms the underlying foundation of a theory, namely, that of simplifying the way in which things operate, to understand how and why the phenomena occur, and to provide an explanation that generalises beyond the specific circumstances (Sturman, 2006:6). This, in turn, allows for a means of predicting any future segment behaviour (Dibb *et al.*, 2002:113).

2.8   BASES USED IN MARKET SEGMENTATION STUDIES

An area of focus in the field of market segmentation that has received considerable interest in the academic literature over the past 60 years is that of segmenting business-to-business markets (Goller *et al.*, 2002:252). However, it should be noted that the key premise that prompts market segmentation in business markets remains similar to that of consumer markets. In fact, considering the evidence from the literature, many bases and applications used are equally applied in both markets - the only difference is that some variables

differ in particular dimensions. For example, demographic variables such as age, gender, educational background have been used as base or descriptor variables in consumer segmentation studies. These variables also apply to individual buyers in a business or industrial market. Similarly, behavioural variables, market communication, positioning and pricing variables can equally apply to business and consumer markets. Goller *et al.* (2002:256) further motivates this premised arguing that segmentation in business markets is possible for two reasons. Firstly, because business markets constitute a diverse number of end-users; and secondly, because the application of products can vary considerably, and as a result consumers seek different product benefits.

The next sections consider bases that have been used in past business segmentation studies as well the use of index variable as segmentation bases.

2.8.1 <u>Bases used in business segmentation studies</u>

The selection of variables to divide and describe a market needs to coincide with the decisions that management face in serving a diverse market (Clarke & Freytag, 2008:1024; Yankelovich & Meer, 2006:125). For example, if management is faced with product development aimed towards small businesses, the target market might be segmented, based on the perceived values and benefits sought by owners of small businesses. On the other hand, sales managers might find a market segmented that is based on sales potential or profitability more useful. Thus, segments are formed, based on a single or a set of variables, so that entities that are grouped together exhibit similar characteristics along the chosen segmentation base(s) (Foedermayr & Diamantopoulus, 2008:248).

The expectation would also be that entities within a segment would show relatively similar responses to marketing stimuli (Dibb, 2005:13). As different variables would cause different segmentation models to emerge, the selection

of appropriate segmentation variables is therefore critical (Foedermayr & Diamantopoulus, 2008:248).

A review of the literature and some past studies reveals the emergence of two main streams of segmentation bases used in business studies. These streams were also highlighted by Sudharshan and Winter (1998:8). The first stream focuses on the characteristics of the business, also referred to as firmographics; while the second stream focuses on the characteristics and behaviour portrayed by decision-makers in the business. Some variables could also be more easily observed than others (Bonoma & Shapiro in Sudharshan & Winter, 1998:9).

For example, firmographics are more easily observed than the personal characteristics of decision-makers. However, as pointed out in Section 2.7.3, acknowledgement should be given to the concerns raised about the limited explanatory value offered by some of these variables.

A study might also utilise a single base variable to segment the market, or several variables can be combined. In most cases the segmentation solution relies on a combination of clusters of variables, which together provide a more complete profile of buyers. This, according to Neal (in Ungerer, 2009:55) is beneficial, because the creative use of a selection of bases for segmentation can lead to a strategic advantage. Ungerer (2009:74) advises that given the range and variety of marketing decisions that marketing practitioners need to make, markets should preferably not be segmented according to single segmentation bases. The approach of combining segmentation bases and using it to segment the market is referred to as multivariate segmentation (Haupt, 2006:1).

Table 2 summarises some of the segmentation variables identified from the literature that could be used as bases in business-segmentation studies (Canever *et al.*, 2007:512; Ferrell & Hartline, 2005:142; Lin, 2002:250; McDonald & Dunbar, 2004:185; Weinstein, 1994:159; Wind, 1978:320). These

variables are categorised by two dimensions, namely: physical and behavioural. In both these dimensions, a further distinction can be drawn on the business and the decision-maker as units of analysis. Segmentation variables that are applied to B-to-C markets might, in some instances, also be adopted to serve B-to-B markets.

Table 2:   Bases for business-to-business segmentation

Physical - Business	Behavioural - Business
Years in operation Stage in life cycle Type of business Geographic location Standard Industrial Classification Size of business by number of employees Turnover Ownership Business unit or department	Usage patterns Brand loyalty Switching pattern
Physical – Decision-maker	**Behavioural – Decision-maker**
Position in business Demographics of decision-maker (for example age and gender)	Psychographics Purchase decision Benefits sought/Importance of a set of benefits Product preferences/Importance of product features Reaction to new concepts (intention to buy, preference over current brand, etcetera) Price sensitivity Media usage Attitude (for example risk taker, risk avoiders)

Source: Canever *et al.* (2007:512); Ferrell & Hartline (2005:142); Lin (2002:250); McDonald & Dunbar (2004:185); Weinstein (1994:159); Wind (1978:320)

2.8.2 Use of index variables as segmentation base

Another type of base used in segmentation studies is that of index variables. This type of base forms a central focus area of this study. An index variable often serves as an indicator or proxy for a particular construct. A single data item sometimes only gives a rough indication of a given variable, while the consideration of several data items might give a more comprehensive and accurate indication (Babbie, 2011:168). Index variables in specific are

composite measures of variables and typically scale or ordinal in nature. In other words, index variables take advantage of any intensity structure that may exist among the attributes.

Considering the use of index variables in business-to-business studies, and more specifically, as measures of business sophistication, a number of studies can be identified from the literature. These studies are listed in Table 3. All of the studies, with the exception of one, focused on measuring sophistication within business entities by concentrating on a specific functional area of the business, such as finance, strategic management, information technology, logistics and human resources. The study by African Response (2006:20), however, covered various functional areas in measuring business sophistication.

Table 3:   Measures of business sophistication

Functional area	Author/s
Finance	Lewis (1998:233)
Business and strategic planning	Hahn (1999:19); Phillips (2000:541); Rudd, Greenley, Beatson & Lings (2008:99); Rue & Ibrahim (1998:24)
Information technology	De Búrca, Fynes & Brannick (2006:1240)
Logistics	Wanke, Arkader & Hijjar (2007:542)
Human resources	Heffernan & Flood (2000:128); Koch & McGrath (1996:344)
Various	African Response (2006:20)

Table 4 lists the various items considered in each of the studies, as well as the index scoring method. The measurement scales used are also specified. It is evident that a number of options exist for index scoring; and they vary between computationally simplistic, and statistically demanding.

Table 4:   Items considered in the construction of various business sophistication indexes

Functional area	Author/s	Items considered for index construction and measurement scales used	Index scoring
Finance	Lewis (1998:233)	Adoption of the following methods and systems in the business (where 'Not adopted' = 0; 'Adopted' = 1): - Establishment of a financial record keeping system. - Extraction and use of financial information provided by the system. - Adoption and use of a personal computer (PC) in support of the system.	Four levels of financial sophistication defined, namely: (1) No financial record keeping system (2) Financial record keeping system adopted (3) Use system as management information system (manually) (4) Use system as management information system (computerised)
Business and strategic planning	Rue & Ibrahim (1998:24)	Adoption of the following in the business (where 'Not adopted' = 0; 'Adopted' = 1): - Prepares a written strategic plan - Plan includes quantified objectives in sales earnings, return on investment, capital growth, share of the market, sales/earnings ratio, and international expansion. - Plan includes budgets for hiring and training of key management personnel, plant expansion, new product development, succession plans, corporate acquisitions, equipment acquisition, research and development, advertising, entering/expanding internationally. - Plan specifically attempts to identify population trends, political developments, family incomes, social currents, non-product technological breakthroughs, labour-management attitudes, national economic trends. - Plan contains procedures for anticipating or detecting differences between the plan and actual performance. - Plan contains procedures for preventing/correcting difference.	Composite scores calculated based on number of activities adopted in a business. The more activities adopted, the higher the level of sophistication.

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Functional area	Author/s	Items considered for index construction and measurement scales used	Index scoring
Business and strategic planning	Phillips (2000:541)	Extent of importance placed within the business on the following (where 'Of no importance' = 1; to 'Extremely important' = 7): - Market segment analysis - Annual budgets - Strength, weakness, opportunities and threats analysis - Yield management - Variance analysis - Standard costing - Statistical techniques - Flexible budgets - Rolling budgets - Payback - Break-even analysis - Activity-based costing - Benchmarking - Internal rate of return - Profit-sensitivity-analysis - Cost-volume-profit analysis and uncertainty - Accounting rate of return - Net present value - Zero-based costing	Index represented by average overall evaluation. Higher average scores are associated with higher levels of sophistication.
	Hahn (1999:19)	Used in business (where 'Yes' = 1; and 'No' = 0): - Environmental analysis that assesses business's internal strengths and weaknesses as well as external threats and opportunities - Developed a mission statement - Defined objectives and strategies for the business covering at least three years - The strategic plan included an implementation process - The strategic plan included control/follow-up methods	Composite scores calculated based on number of activities adopted in a business. The more activities adopted, the higher the level of sophistication.

Functional area	Author/s	Items considered for index construction and measurement scales used	Index scoring
Business and strategic planning	Rudd, Greenley, Beatson & Lings (2008:99)	Extent of emphasis placed within the business on (where 'No emphasis' = 1; to 'Very strong emphasis' = 5): - Mission statement - Analysis of competitor trends - Analysis of supplier trends - Analysis of market trends - Internal analysis - Long-term, corporate level strategies - Medium term, business level strategies - Short term, functional level strategies - Barriers to strategy implementation. - Analysis of contingencies - On-going evaluation and control	Index represented by average overall evaluation. Higher average scores are associated with higher levels of sophistication.
Information technology	De Búrca, Fynes & Brannick (2006:1240)	Perceived sophistication of information technology equipment relative to competitors (where 'In need of replacement' = 1; to 'State-of-the-art' = 5).	Index represented by average overall evaluation. Higher average scores are associated with higher levels of sophistication.

Functional area	Author/s	Items considered for index construction and measurement scales used	Index scoring
Logistic	Wanke, Arkader & Hijjar (2007:542)	Used in business (where 'Yes' = 1; and 'No' = 0): - Vehicle tracking - Routing - Delivery scheduling - Radio frequency - Bar codes - Picking - Labelling - Freight audit - Sales forecasting - Purchase scheduling - Supplier management - Shipment status - Electronic data interchange - Enterprise resource planning system - Inventory management in customer	Factor analysis used to identify emerging sophistication constructs. Index calculated from standardised variables.
Human resources	Koch & McGrath (1996:344)	Business engages in (where 'Yes' = 1; and 'No' = 0): - Human resources planning - Formally evaluates hiring practices on a regular basis - Utilisation of aptitude testing - Utilisation of drug testing Sum of: - Number of interviews per hire. - Number of recruiting sources per hire. - Number of formal training programs. - Extent of use of promotion-from-within	Composite scores calculated based on business's engagements and sum values. Higher scores associated with higher levels of sophistication.

Functional area	Author/s	Items considered for index construction and measurement scales used	Index scoring
	Heffernan & Flood (2000:128)	Adoption of competency human resources processes in the business (where 'Yes' = 1; and 'No' = 0): - Recruitment and selection - Training and development - Performance management - Succession planning remuneration - Promotion	Composite scores calculated based on number of activities adopted in a business. The more activities adopted, the higher the level of sophistication.

Functional area	Author/s	Items considered for index construction and measurement scales used	Index scoring
Various	African Response (2006:20)	The final set of questions used in index construction. Nominal measurement scales used. - Type of business (legal form)? - Sell goods as you buy them or add value or both? - Have a written employment contract for employees? - Type of premises that business operates from? - Own, rent or just use the place where you trade / run your business from? - Services and equipment? - Partners or shareholders? - Do you have a written shareholders/partnership/ members agreement? - Keep financial records or accounts? - Do you keep these financial records yourself/internally or do someone from outside help you? - Are your financial records audited? - Is this business a franchise? - Are your company / business a subsidiary / part of another company? - Do you have any affiliations with international companies? - Do you do any business / trade with anyone outside South Africa? - Import/ export/both? - Offer goods or services on credit? - Type of credit? - Pay taxes? - Comply with acts? - Professional services handled by staff? - Banks used? - Type of banking services utilised? - Do you have any loans for your business? - From where did you get the loan? - Types of insurance paid for by the business?	Iterative process of principle component analysis and stepwise regression to calculate and refine index score.

2.9   CHAPTER SUMMARY

This study deals in essence with the process of index construction as a means of measuring a hypothetical construct, and applying it as a method of market segmentation. This chapter has, therefore, considered some of the main principles of market segmentation. Attention has been given to the segmentation process, with the purpose and antecedents of market segmentation emphasised, as well as the factors that are deemed critical for segmentation success.

It is evident from the literature review that market practitioners use an array of bases for segmentation. The application of index variables as segmentation bases was therefore also highlighted from the literature. Of importance was also noting some of methods that can be applied for index construction and segment formation.

In the next chapter, aspects relating more specifically to index construction are to be addressed.

CHAPTER 3: INDEX CONSTRUCTION

3.1   INTRODUCTION

This focus considers the characteristics of an index and the typical steps followed in the construction of such a variable. From the literature, selective approaches to index construction are more fully described, with particular emphasis on the steps and methods used during the processes. These results in the formulation of some key considerations that can be regarded highly relevant in the construction of a commercial farming sophistication index.

3.2   CHARACTERISTICS OF AN INDEX

Both Babbie (2011:169) and Spector (1992:1) make reference to various characteristics of index variables. Firstly, an index is derived from multiple items. This means that the items are summated or combined, thereby converting a specific procedure into a single measurement or scale.

Secondly, the individual items that form the basis of the index measure something that is underlying, quantitative and on a measurement continuum. Index variables are therefore typically ordinal in nature.

Thirdly, an answer or response to an item cannot be classified in terms of 'right' or 'wrong'. An index variable therefore constitutes a scale measurement that is indicative of some hypothetical construct that can typically not be measured by a single question or item. Higher index values might indicate 'more off' and lower values 'less off', with neither being 'right' or 'wrong'.

Lastly, a good index is evaluated in terms of its reliability and validity. Both these aspects are considered as part of the last step in index construction.

3.3 STEPS IN INDEX CONSTRUCTION

Babbie (2011:169) notes that the task of index construction is not a simple undertaking; while Spector (1992:v) described the process as being seldom easy. As in the case of the market segmentation process, comprising a number of logical and inter-linking steps, index construction also follows a stepwise process. In fact, the process of index construction when applied as a method of segmentation, forms sub-steps in the segmentation process.

The work of Babbie (2011) and Spector (1992), in particular, provides academic and theoretical reference in the process of index construction. On the other hand, research conducted by African Response (2006), the South African Advertising Research Foundation (2009), and Jensen, Spittal, Chrichton, Sathiyandra and Krishnan (2002) provides specific pragmatic and empirical reference in identifying the typical reasons for constructing an index, as well as consideration and common steps relevant in the process. These studies are reviewed in more detail in Section 3.4.

Three steps in index construction can commonly be distinguished, namely: (1) Item/variable selection; (2) examining the empirical relationships of variables and combining of these items into an index; and (3) validating the index.

More specifically with regard to this study, the aim was to construct a measure of commercial farming sophistication in the form of an index that is one-dimensional, can discriminate across the full spectrum of commercial farming businesses in South Africa, and is both valid and reliable.

The index is constructed through the assignment of scores, recognising that some variables included in the index will reflect a relatively low level of sophistication, while others reflect something higher. Thus, the index takes advantage of any intensity structure that may exist among variables.

3.3.1 Item selection

In the first step, Babbie (2011:172) notes that when a composite index is created in order to measure some variable or construct, an important criterion to consider is the face validity of items. The selection of items should be guided by a clear and precise definition of the construct itself (Spector, 1992:7). An index cannot be developed until it is clear exactly what that index is intended to measure. For example, the selection of items to measure the various sophistication constructs listed in Table 4 was guided by the formulation of specific definitions. These definitions provided relevant points of reference for the researchers to identify variables related to the construct under consideration. For instance, logistical sophistication was defined as a composite of three dimensions: the degree of organisational formalisation, the use of information technology, and the use of indicators to monitor performance (Wanke *et al.*, 2007:545). Based on this definition, the researchers identified 19 possible variables related to the sophistication of the logistics function. Similarly in the context of this study, items included in measuring commercial farming sophistication should, therefore, appear at face value to indicate business sophistication.

Lastly, an important aspect to consider in item selection is the degree of variation that would be provided by the items. If an item provides no variation, it would not be very useful for the construction of an index.

3.3.2 Combining of variables into an index

During the second step of the index construction, the relationships among items should be considered, with the anticipation of combining items into a single and one-dimensional construct variable. By assigning scores for particular responses on an item, a single composite index can be created through the basic summation of items. In these instances, each item score is weighted

equally. Alternatively, multivariate statistical techniques, such as exploratory factor analysis and principal component analysis could be considered in the construction of the index. Exploratory factor analysis and principal component analysis use the multi-variability between items to derive a new single construct measure. In addition, exploratory factor analysis and principal component analysis provide solutions for assigning different weights to items through the calculation of factor scores. The weights typically present an indication of the relative 'importance' or extent of contribution of specific items towards the final index scores.

3.3.3 Index validation

The last step involves index validation. Item analysis provides a means of testing for internal validation. In other words, the index is examined across the item responses which comprise it. It is also advisable to test for external validation. Commercial farming businesses that are, for example, classified as having high levels of sophistication should appear to also be sophisticated in relation to other relevant items measured in the study.

Tonks (2009:349) provides additional views on validation, noting that it is important to assess index variables as to their extent in meeting the different approaches to establishing validity, namely: those of construct, content and criterion validity. Construct validity is probably the most difficult to establish, as it is concerned with what the construct is ultimately measuring. Many variables, which are easily "observable", such as type of legal form or turnover, do not present any formidable difficulties in establishing construct validity. For example, the index of logistics sophistication that was constructed by Wanke *et al.* (2007:542) were derived from activities and functions used in the business, such as vehicle tracking, routing, radio frequency and bar codes. These activities are typically easily observed or accounted for in the business based on them being either used or not used.

However, an index measure that is derived from less observable items, such as subjective evaluations or perceptions could be more challenging. For example, the study of Phillips (2000:541) constructed an index of business and strategic planning sophistication based on the extent of importance placed within the business on conducting a range of strategic analyses. A seven-point importance rating scale was used, with the index constituting an average overall evaluation. In this instance, the importance placed on the items is less observable than the actual conducting of these analyses within the business.

Tonks (2009:349) proposes a multitrait-multimethod matrix approach for establishing construct validity. This approach provides a means of decomposing construct validity into the assessments of convergent, discriminant and nomological validity. The first step is to identify the extent to which there exists a positive correlation between the construct and other similar constructs. This would also suggest that the inter-correlation between items within a factor is typically high. Secondly, it is important to confirm that no correlation exists with other theoretically unrelated constructs; thirdly, it is necessary to establish the consistency with respect to different, but associated constructs. However, Tonks (2009:349) warns that such procedures are complex and require abundant data. Nonetheless, whether or not they are used, some subjective judgments have to be made.

Content validity concerns determining the suitability of the segmentation variable for a clearly specified domain of interest. This is usually done by referring to the literature, or by trusting the judgement of a well-informed professional or panel of experts.

Despite the scholarly debates concerning construct and content validity, Tonks (2009:349) remarks that the role of subjectivity in establishing these types of validity may be considered irrelevant, if a given general segmentation variable has adequate criterion validity. Of the three types of validity identified here, it is criterion validity that is likely to be seen as immediately pragmatic, and which

determines some of the criteria for segment qualification and segment attraction.

Tonks (2009:349) states: "In the case of a basic segmentation theory or model, criterion validity concerns the extent to which the available 'independent' segmentation variables are associated with the 'dependent' criterion of interest – which is usually some aspect of behaviour. That association may or may not be casual, but the essential requirement is that the 'independent' descriptor variable discriminates the 'dependent' criterion variable in a useful way; and the general rule is that homogeneity is required within segments, and heterogeneity between segments."

As part of the validation, aspects relating to the reliability of the scale should also be considered. Reliability may be considered in two ways, namely: test-retest reliability and internal-consistency reliability (Leedy & Ormrod, 201:93). The aforementioned relates to a scale or index yielding consistent measurement over time. The latter means that multiple items, which are designed to measure the same construct, would consistently show high levels of inter-correlation with one another. Spector (1992:6), however, does note that it is possible that a scale demonstrates only one of these types of reliability. Various methods and strategies exist to test for reliability. These, for example, include the calculation of the Cronbach alpha coefficient, which provides a means for measuring the internal reliability consistency of the newly created scale or index (Pallant, 2010:97).

3.4   SELECTED APPROACHES TO INDEX CONSTRUCTION

This study concerns the measurement of commercial farming sophistication in South Africa and serves as illustration of the process of index construction and applying it as a method of market segmentation. Despite index construction being widely used by marketing researchers, the availability of empirical studies

to illustrate the process of index construction as a method of segmentation in a business context is scarce.

This section presents three selected approaches that were followed in the construction of index variables and more specifically, applying it as methods of market segmentation. The focus of discussion falls on (1) the aims that were associated with the construction of an index and applying it as a method of segmentation; (2) steps followed in the index construction process; and (3) outcomes evident from the processes. The target markets considered in the various studies are therefore not of particular relevance, but are regarded incidental for the purpose of reviewing these approaches and in the context of this discussion.

3.4.1 The South African Advertising Research Foundation Living Standards Measure (SAARF LSM)

3.4.1.1 Background

The Living Standards Measure (LSM) was developed by the South African Advertising Research Foundation (SAARF) during 1988/89 – with the aim of providing a measure – using a combination of variables that could distinguish living standards better than could any single demographic variable (South African Advertising Research Foundation, 2009:92). According to SAARF, it provides a unique means of segmenting the South African market, as it cuts across race and other outmoded techniques of categorising people, and instead groups people, according to their living standards by using criteria, such as degree of urbanisation and ownership of cars and major appliances.

The construction of the SAARF LSM was based on a multi-level approach involving various steps in the process. Initial requirements stipulated that the index should have broad application across the total South African market. In addition, it should be simple to use and also important; it should be easy to link

to other surveys being conducted in the market. Lastly, it should also be stable over time, but sensitive enough to register changes.

3.4.1.2   Steps in the index construction

Firstly, a large number of possible variables were selected on the basis of criteria that were believed could contribute towards explaining or measuring levels of living standards. In other words, items were selected on face value. The variables were selected from a pre-developed questionnaire that was used as part of SAARF's All Media and Products Surveys (AMPS). The questionnaire was thus therefore not originally designed with the primary aim of developing an index of living standard, but was incidental in the context of the study. The variables included the possession of a range of durable household articles, access to reticulated water and electricity supplies, use of the various media, and a wide range of demographics, including population group, income, education and others. Some 20 variables were coded into 71 classes. This meant that out of 20 variables, 71 dummy variables were derived (each coded as 1 or 0), serving as indicators of possession, access and usage.

Secondly, using principal component analysis, an index score was calculated for each respondent. The variables used were the 71 indicator variables, because an interval scale cannot be assigned to these variables (South African Advertising Research Foundation, 2009:92). The principal component analysis technique identified a number of emerging factors that accounted for the variability found in the original classes. It was found that the first factor provided for the largest proportion of the variation in the data, with the other factors catering for smaller proportions.

For each case in the AMPS database, an index score was derived based on the loadings of the first factor only. Using the total population frequency distribution as guidance, the index scores were divided into a number of unique, non-overlapping categories. Category groups were, henceforth, cross-tabulated

against aspects, such as the consumption of goods, services and media to obtain an indication of whether the category groups provided adequate segmentation capabilities of the population.

Due to the large number of variables used, the third step focused on reducing the number of explanatory variables. This was done by identifying those variables, which had the greatest discriminatory power, and then weighting the remaining variables optimally. Part of the analysis again involved a principal component analysis to examine the spread of the data points of the variables, with the aim of establishing the combination of variables along which the largest proportion of the spread occurred.

Using stepwise regression analysis, the sub-set of variables was identified that most accurately predicted the scores of the respondents on the factor that catered for the largest proportion of the variation in the data. A total number of 13 variables were used, to measure a respondent's living standard and indicate access to services and durables of an individual in a household. The specific variables were:

- Polisher/vacuum cleaner
- Fridge/freezer
- TV set
- Water/electricity
- Washing machine
- No car in household
- Hi-Fi/music centre
- Sewing machine
- Non-supermarket shopper
- Rural dweller (Outside Pretoria, Vereeniging and Western Cape)
- No domestic worker
- No VCR set
- No tumble drier

Each variable also carried a different weight, positive or negative, which was derived from the stepwise regression analysis. A respondent's position on the SAARF LSM scale could then be derived by adding together the weights of the variables that s/he possessed. A constant was also added to the total score to eliminate any negative total scores.

The next step involved index validation, namely, to examine the association of LSM scores against other variables that could be expected to be associated with the living standards. These included, for example, personal and household income, educational level of respondents, demographic group and urban/rural area.

Having validated the LSM scores, SAARF henceforth used the scores to form a number of equal sized groups. The groups were investigated in terms of mean index scores as well their properties relating to the items that formed the basis of the index scores. Where adjacent groups were viewed to be similar, they were combined. A final set of eight LSM segments were formed. These LSM segments represented homogeneous groups in terms of living standards. This, in essence, constituted the tool provided for marketing research practitioners.

3.4.1.3 Outcomes of original analysis and further development

Since the original development of the LSM in 1988/89, and the specifications of the 13 variables, SAARF has to date initiated various reviews of the measurements. Initial reviews were largely focused on addressing some of the unforeseen difficulties, challenges and biases that were experienced through the early developmental phases of the LSM. For example, from 1989 to 1992 SAARF adjusted the LSM weights and changed the variables where necessary to provide for the best fit to the data.

This, however, meant that a year-on-year comparison of the results was not possible. In 1993, a decision was made not to adjust the variables annually,

unless large changes were required. This resulted in a rework of the statistical process and model to ensure that LSM variables could be updated continuously without breaking the trend (South African Advertising Research Foundation, 2008:94).

A review of LSM was again done in the late 1990s. The list of variables was expanded to include 20 indicator variables. In 2001, SAARF introduced another review, resulting in the expansion of the original eight segments groups to 10 groups, as well as increasing the predictor variables to 29.

Table 5 lists the most recent variables used for the calculation of the LSM scores (South African Advertising Research Foundation, 2012:36). The list consists of 29 variables. The table also shows the squared multiple correlation, indicating the extent of correlation between the variable and the LSM score. The last column shows the weight that was derived from the stepwise regression analysis, and used to calculate a respondent's LSM score.

Table 5: **SAARF LSM list of variables 2012 (South African Advertising Research Foundation, 2012:36)**

Variable number	Attribute	Squared Multiple Correlation	Weight
1	Hot running water from a geyser	0.6167	0.185224
2	Computer –Desktop/Laptop	0.7203	0.311118
3	Electric stove	0.8031	0.16322
4	No domestic workers or household helpers in household	0.8437	-0.30133
5	0 or 1 radio set in household	0.8696	-0.245
6	Flush toilet in/outside house	0.8933	0.113306
7	Motor vehicle in household	0.9105	0.16731
8	Washing machine	0.9228	0.149009
9	Refrigerator or combined fridge/freezer	0.9339	0.134133
10	Vacuum cleaner/floor polisher	0.9411	0.164736
11	Pay TV (M-Net/DStv/TopTV) subscription	0.9470	0.12736
12	Dishwashing machine	0.9513	0.212562
13	3 or more cell-phones in household	0.9553	0.184676
14	2 cell-phones in household	0.9588	0.124007
15	Home security service	0.9620	0.151623

Variable number	Attribute	Squared Multiple Correlation	Weight
16	Deep freezer – free standing	0.9651	0.116673
17	Microwave oven	0.9679	0.126409
18	Rural resident (excluding Western Cape and Gauteng rural)	0.9703	-0.12936
19	House/cluster house/town house	0.9732	0.113907
20	DVD player/Blue Ray Player	0.9753	0.09607
21	Tumble drier	0.9771	0.166056
22	Home theatre system	0.9790	0.096072
23	Home telephone (excluding cell-phone)	0.9804	0.104531
24	Swimming pool	0.9816	0.166031
25	Tap water in house/on plot	0.9829	0.123015
26	Built-in kitchen sink	0.9842	0.132822
27	TV set	0.9852	0.120814
28	Air conditioner (excluding fans)	0.9861	0.178044
29	Metropolitan dweller (250 000+)	0.9871	0.079321

Table 6 shows the calculation of LSM segments. Weights are summated for those variables with which the respondent complies. A constant of -0.81052 is added, and based on the total summated weights; a respondent is then grouped into one of the ten LSM segments, depending on the defined ranges.

Table 6: **Calculation of LSM (South African Advertising Research Foundation, 2012:36)**

LSM Group	Total weight
1	Less than -1.390140
2	-1.390139 to -1.242000
3	-1.242001 to -1.011800
4	-1.011801 to -0.691000
5	-0.691001 to -0.278000
6	-0.278001 to 0.382000
7	0.381999 to 0.801000
8	0.800999 to 1.169000
9	1.168999 to 1.745000
10	More than 1.744999

In addition to homogenising the market in terms of living standards, the application of the LSM index as segmentation tool facilitates an improved understanding of the market for marketing practitioners, and could lead to the identification of new opportunities or better allocation of resources. In fact, the SAARF LSM is considered to be one of the most widely used marketing research tools in South Africa (Haupt, 2006:1). While a detailed description of the application of the LSM segmentation tool goes beyond the scope of this study, some examples of how the tool is used to describe and understand behaviour in the market is provided as illustration. The LSM tool has, for example, been used as explanatory variable for cell-phone penetration in South Africa. Figure 6 shows the proportion of the South African population, 16 years and older, that owned, rented or used a cell-phone in 2011 within the various LSM segments. The higher the measured living standard of a respondent, the more likely s/he is to own, rent or use a cell-phone.

Figure 6: **Percentage cell-phone penetration in South Africa December 2011 (South African Advertising Research Foundation, 2012:47)**
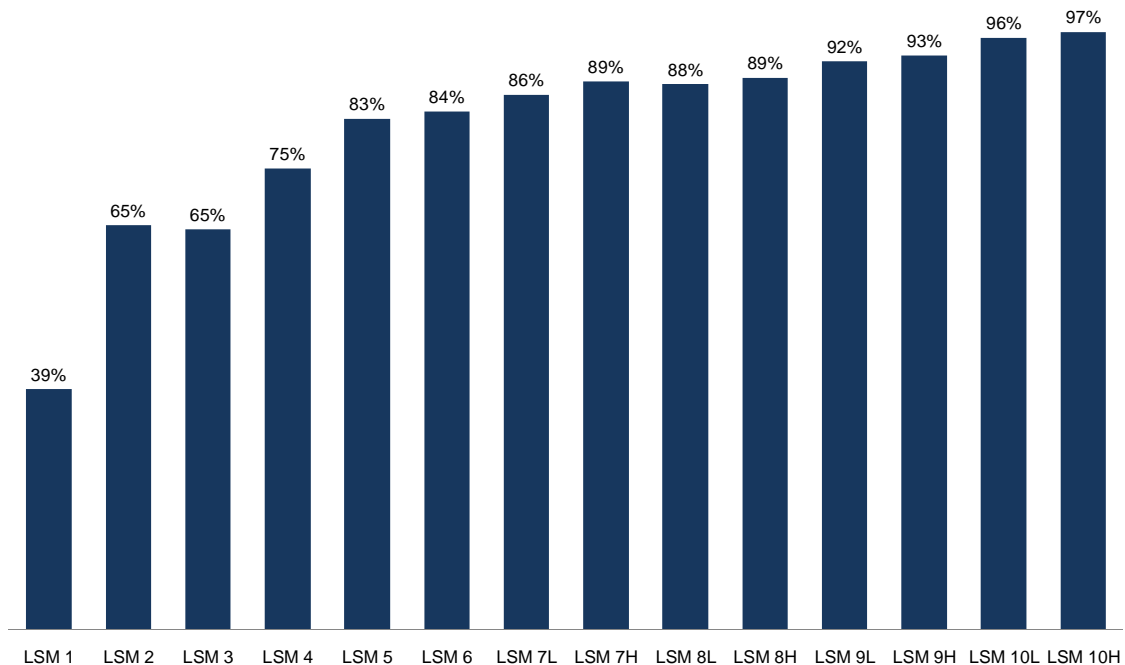
A profile of each segment has also been developed by SAARF, which assist researchers and marketing practitioners' in understanding market behaviour. The profile also provides information on aspects such as demographics, media consumption, educational background, average monthly household earnings, radio listenership and access to banking products. For example, the first LSM segment constitutes an approximate 1.9% of the South African population. These segment members tend to be older than 50 years, have completed primary schooling, live in small urban/rural areas, and earn a household income on average of R1 369 per month; with radio as a major channel of media communication, with Wenene FM and Ukhozi FM attracting significant listenership. They typically have minimal access to services.

Similar profiles exist for the other LSM groups and are summarised in Table 7.

Table 7: **A profile of LSM segments (South African Advertising Research Foundation, 2012:53)**

LSM 1 (1.9%)	**LSM 2** (5.1%)
Demographics Gender: Male and female Age: 50+ Schooling: Primary completed Living: Small urban/Rural area Structure: Traditional hut Household income: R1 369 (average)	**Demographics** Gender: Female Age: 15 – 24 and 50+ Schooling: Some high school Living: Small urban/Rural area Structure: Squatter hut shack; matchbox; traditional hut Household income: R1 952 (average)
Media Radio a major channel of media communication; mainly African Language Stations (ALS) – Umhlobo Wenene FM, Ukhozi FM; community radio	**Media** Radio: Commercial, mainly ALS – Umhlobo Wenene FM; Ukhozi FM
General Minimal access to services Minimal ownership of durables, except radio sets Mzansi bank account Activities: Minimal participation in activities; singing	**General** Communal access to water Minimal ownership of durables, except radio sets; stoves Mzansi bank account Activities: Minimal participation in activities; singing; attend burial society meetings and traditional gatherings

LSM 3 (6.1%)	**LSM 4** (12.2%)
Demographics Gender: Female Age: 15 - 34 Schooling: Some high school Living: Small urban/Rural area Structure: Squatter hut shack; traditional hut Household income: R2 545 (average) **Media** Radio: Mainly ALS – Umhlobo Wenene FM; Ukhozi FM **General** Water on plot or communal Minimal ownership of durables, except radio sets; stoves Mzansi bank account Activities: Singing	**Demographics** Gender: Male Age: 15 – 34 and 50+ Schooling: Some high school Living: Small urban/Rural area Structure: Squatter hut shack; matchbox; traditional hut Household income: R3 141 (average) **Media** Radio: Mainly ALS – Gagasi, Motsweding FM, Umhlobo Wenene FM, Ukhozi FM; community radio **General** Electricity; water on plot or communal; non-flush toilet TV sets; electric hotplates Mzansi bank account Activities: Attend gatherings; go to night clubs
LSM 5 (17.4%)	**LSM 6** (22.4%)
Demographics Gender: Male and female Age: 25 - 34 Schooling: Some high school Living: Small urban/Rural area Structure: House; matchbox; matchbox improved Household income: R4 200 (average) **Media** Radio: Commercial mainly ALS – Lesedi FM; Motsweding FM; Ukhozi FM; community radio TV: SABC 1, 2, 3; etv; TopTV **General** Electricity; water on plot; flush toilet outside TV sets; hi-fi/radio set; stove; fridge Mzansi bank account Activities: Singing; bake for pleasure; go to night clubs; attend gatherings; buy lottery tickets	**Demographics** Gender: Male Age: 25 - 49 Schooling: Matric Living: Large urban Structure: House; townhouse; cluster house Household income: R6 454 (average) **Media** Radio: Wide range of commercial and community radio TV: SABC 1, 2, 3; etv; TopTV; community TV Any SAARF All Media & Products Survey (AMPS) newspaper Outdoor **General** Electricity; water in home; flush toilet in home TV set; fridge/freezer; microwave oven Savings and Mzansi bank account Activities: Hire DVDs; go to night clubs; take away in the past 4 weeks; attend gatherings; buy lottery tickets; go to gym

LSM 7 low (4.9%)	**LSM 7 high** (5.8%)
Demographics Gender: Female Age: 35+ Schooling: Matric and higher Living: Urban Household income: R9 768 (average)	**Demographics** Gender: Male Age: 35+ Schooling: Matric and higher Living: Urban Household income: R12 311 (average)
Media Radio: Wide range of commercial and community radio TV: SABC 1, 2, 3; etv; DStv; TopTV; community TV All print Accessed Internet past 7 days Outdoor	**Media** Radio: Wide range of commercial and community radio TV: SABC 1, 2, 3, etv; M-Net; DStv; TopTV, community TV All print Accessed Internet past 7 days Cinema; outdoor
General Full access to services Savings accounts Increased ownership of durables plus DVD and motor vehicle Participation in all activities	**General** Full access to services, including cheque and savings account Increased ownership of durables plus DVD and motor vehicle Participation in all activities
LSM 8 low (4.2%)	**LSM 8 high** (4.1%)
Demographics Gender: Male Age: 35+ Schooling: Matric and higher Living: Urban Household income: R14 275 (average)	**Demographics** Gender: Male Age: 35+ Schooling: Matric and higher Living: Urban Household income: R15 499 (average)
Media Radio: Wide range of commercial and community radio TV: SABC 1, 2, 3; etv; M-Net; DStv; TopTV, community TV All print Accessed Internet past 7 days Cinema; outdoor	**Media** Radio: Wide range of commercial and community radio TV: SABC 1, 2, 3, etv, M-Net; DStv; TopTV, community TV All print Accessed Internet past 7 days Cinema; outdoor
General Full access to services and bank accounts Full ownership of durables, including PC Increased participation in activities	**General** Full access to services and bank accounts Full ownership of durables, including PC Increased participation in activities

LSM 9 low (4.6%)	LSM 9 high (4.6%)
Demographics Gender: Male Age: 50+ Schooling: Matric and higher Living: Urban Household income: R18 444 (average) **Media** Radio: Wide range of commercial and community radio TV: SABC 2, 3; etv; M-Net; DStv; TopTV, community TV All print Accessed Internet past 7 days Cinema; outdoor **General** Full access to services and bank accounts Full ownership of durables Increased participation in activities, excluding stokvel meetings	**Demographics** Gender: Male Age: 35+ Schooling: Matric and higher Living: Urban Household income: R22 887 (average) **Media** Radio: Wide range of commercial TV: SABC 2, 3; etv; M-Net; DStv; TopTV, community TV All print Accessed Internet past 7 days Cinema; outdoor **General** Full access to services and bank accounts Full ownership of durables Increased participation in activities, excluding stokvel meetings
LSM 10 low (3.3%)	LSM 10 high (3.3%)
Demographics Gender: Male Age: 35+ Schooling: Matric and higher Living: Urban Household income: R27 807 (average) **Media** Radio: Wide range of commercial TV: SABC 3; M-Net; DStv; TopTV, community TV All print Accessed Internet past 7 days Cinema; outdoor **General** Full access to services and bank accounts Full ownership of durables Increased participation in activities, excluding stokvel meetings	**Demographics** Gender: Male Age: 35+ Schooling: Matric and higher Living: Urban Household income: R33 590 (average) **Media** Radio: Wide range of commercial TV: M-Net; DStv; TopTV, community TV All print Accessed Internet past 7 days Cinema; outdoor **General** Full access to services and bank accounts Full ownership of durables Increased participation in activities, excluding stokvel meetings

3.4.2 The New Zealand Economic Living Standard Index (ELSI scale)

3.4.2.1   Background

The objective of the development was to construct a broad-spectrum scale suitable for measuring the living standards of New Zealanders (Jensen *et al.*, 2002:17). The model that formed the basis of the development postulates that "variations in living standards can be validly specified on a single underlying dimension, that is the source of the associations between a number of observable variables." In addition, the key assumption is made that individuals included in the model can be ranked along a continuum reflecting their living standard.

The aim was to construct an index that:

- Could discriminate across the full continuum;
- Was a direct measure, which could be used over a wide range of non-monetary descriptive indicators;
- Was one-dimensional;
- Was continuous;
- Was valid and reliable;
- Provided valid comparisons between sub-populations;
- Provided scores, which were readily interpretable; and
- Permitted monitoring over time.

The New Zealand ELSI scale, therefore, consolidates a large amount of information about different aspects of individual economic wellbeing into a single index (Jensen *et al.*, 2003:72).

3.4.2.2   Steps in the index construction

The data used for the construction of the scale were based on responses obtained from individuals who had participated in a national household survey (Jensen *et al.*, 2003:73). A questionnaire served as a data-gathering instrument, which included questions about the respondent and his/her economic family unit. According to Jensen *et al.* (2003:73), an economic family unit refers to "a person who is financially independent, or a group of people who usually reside together, and are financially interdependent, according to current social norms."

The development of the ELSI scale consisted of two inter-linking processes or phases. The first phase involved the development of a generic scale of living standard for New Zealanders, and being grounded strongly in the theory. However, the scale was derived using confirmatory factor analysis (CFA), and as such, restricted the replication of the scale in future studies. The second phase, therefore, considered the derivation of a general use form of the scale that could be easily calculated by other researchers and survey practitioners without depending on using CFA. This was in line with the original aims, namely, to develop an index that could be calculated and applied in other surveys, and be readily interpretable. This general use form of the standard of living scale would be referred to as the Economic Living Standard Index or ELSI.

The development of the generic living standard scale consisted of three steps. The first step in the process involved the identification of indicator variables that could be used to measure the living standards of New Zealanders. A total of five such indicators were identified, namely: (1) Ownership restrictions; (2) social participation restrictions; (3) economic behaviour; and ratings of (4) adequacy of income; and (5) standard of living.

The first three indicators were represented by sets of items, while the last two indicators were self-rating items. The items representing ownership restriction

measured the possession of household items of the respondent. Social participation restrictions focused on a respondent's engagement in various forms of recreation and social participation. Economising behaviour took into account the things that the respondent consumes.

The focus of measurement, therefore, fell on various activities and ownership, rather than focusing on the resources that would enable them to do or to acquire these things, addressing the objective of developing an index based on non-monetary dimensions.

Next, a structural equation-modelling approach was adopted, with confirmatory factor analysis (CFA) as the main statistical technique in the development of the generic living standard scale. For the CFA, the living standard was conceptualised as a latent variable. According to this approach, the latent variable existed independently of the particular set of indicators (Jensen *et al.*, 2003:73). In other words, the same latent variable should be able to be observed in the properties of a different set of indicators.

Jensen *et al.* (2003:74) also summarised the latent variable by describing it as follows:

- It cannot be observed directly;
- It is inferred from the pattern of statistical associations between the indicator variables;
- It has been specified by using the method of CFA;
- It is hypothesised as being a single, one-dimensional construct;
- It is hypothesised as being able to account for the associations between the indicator variables; and
- It is only accepted as existing if the data can be shown to fit the CFA model based on the indicator variables.

The CFA yielded a regression equation that estimates the values of the latent variable from the observed indicators. These values represent the generic scale of living standard.

Refer to Figure 7, which presents the structural equation model that was defined for the development of the generic living standard scale.

Figure 7: **Conceptual model of generic living standards scale for New Zealand (Jensen *et al.*, 2002:61)**
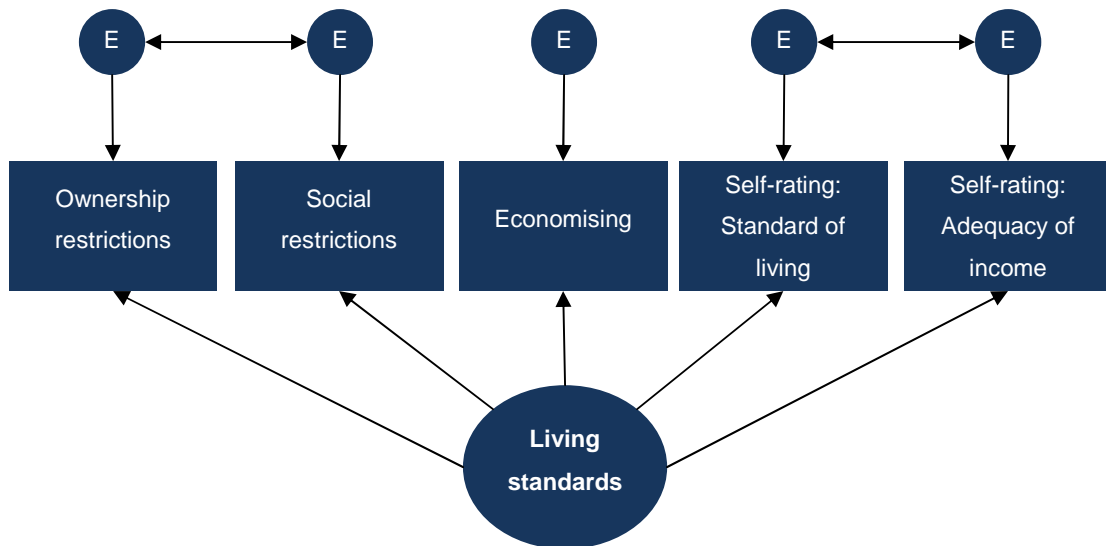
The third and last step involved validation of the scale. Jensen *et al.* (2002:75) postulate that encapsulated within the various definitions of validation lies "the idea that a test must be evaluated against some criteria, to determine whether it measures what it was intended to measure." This process was achieved by examining the association between the generic scale and a number of variables that were expected to be associated with living standards.

Having derived and validated the generic living standard scale, the researcher set out to derive a more simplistic and general-use version of the scale. According to Jensen *et al.* (2003:80), the development was guided by the following criteria:

- The measure should be robust, replicable, and useful in future surveys from which separate samples are drawn.

- The measure should have a simple procedure for computing total scores to enable its easy use by a wide range of researchers and survey practitioners.

- The measure should be suitable for sub-group analysis, including the examination of individual groups and comparisons between groups. It was considered important that the given item set would not unduly bias the results of any one sub-group or another.

- Finally, the measure should still maintain the properties of the CFA generic scale.

In essence, the process should produce a new set of values that closely approximated those obtained by the regression equation.

The first step involved the choice of items to be used for the construction of the scale. Consideration was given to identify a set of items seen as desirable equally across the sample. This was deemed important, as failure to do so could have resulted in the inclusion of items, which were, for example, only desired by those who could afford them. At the same time, it was also critical to identify items where the probability of participants endorsing how important they perceived a given item to be across the different levels of standard of living and sub-groups.

Using items that were only regarded as important by some groups would have introduced skewness into the measurement of the construct as judgements of importance would surely have impacted upon item attainment. A desired item that is expensive is more likely to attract an individual's scarce resources if it is important to them, potentially causing them to forego the attainment of several

other items that are less expensive, or less important. By contrast, if it is desired but unimportant, it may be foregone in favour of a number of other items.

Jensen *et al.* (2002:83) further noted that a second aspect considered during item selection involved the capacity of the item to offer discriminating power between people with a low standard of living and those with a higher standard of living.

The final list of items identified by the researchers to be used for the calculation of the ELSI scale is reported in Table 8.

Table 8: **Items used for the development of a generic scale measuring living of standard of New Zealanders (Jensen *et al.*, 2003:75)**

Economising items	Ownership restrictions (did not own because of cost)	Social participation restrictions (did not do because of cost)	Self-assessment of standard of living
Less/cheaper meat	Telephone	Give presents to family/friends on special occasions	Standard of living (self-rating)
Less fresh fruit/vegetables	Secure locks	Visit hairdresser once every 3 months	Adequacy of income (self-rating)
Bought second-hand clothes	Washing machine	Holiday away from home every year	Satisfaction with standard of living (self-rating)
Worn old clothes	Heating in main rooms	Overseas holidays once every 3 years	
Put off buying new clothes	Good bed	Night out once a fortnight	
Relied on gifts of clothes	Warm bedding	Have family or friends over for a meal at least once a month	
Worn-out shoes	Winter coat	Space for family to stay the night	
Put up with cold	Good shoes		
Stayed in bed for warmth	Best clothes		
Postponed doctor's visits	Pay TV		
Gone without glasses	Personal computer		
Not picked up prescription	Internet		

Economising items	Ownership restrictions (did not own because of cost)	Social participation restrictions (did not do because of cost)	Self-assessment of standard of living
Cut back on visits to family/friends	Contents insurance		
Cut back on shopping	Electricity		
Less time on hobbies			
Not gone to funeral			

The specification of a score procedure followed the identification of the items. The challenge was to develop a procedure that would be easy to describe and apply in future survey research studies, yet would not result in a significant loss of information or measurement precision. Various approaches were investigated. Jensen *et al.* (2003:89) noted that a critical consideration was the requirement of a very high correlation ($r > 0.95$) between ELSI and the generic scale, and that ELSI should preserve the shape of the distribution of the generic scale.

Having taking these issues into account, a specific coding system was formulated. Items were coded as follows:

Ownership restrictions:

    Enforced lack = 0

    Ownership or not wanting = 1

Social participation restrictions

    Enforced lack = 0

    Participation or not wanting = 1

Economising behaviours:

 A lot = 0

 A little = 1

 Not at all = 2

Self-rating: Standard of living:

 Low = 0

 Fairly low = 1

 Medium = 2

 Fairly high = 3

 High = 4

Self-rating: Satisfaction with standard of living:

 Very dissatisfied = 0

 Dissatisfied = 1

 Neither dissatisfied nor satisfied = 2

 Satisfied = 3

 Very satisfied = 4

Self-rating: Adequacy of income:

 Not enough = 0

 Just enough = 1

 Enough = 2

 More than enough = 3

Responses to the items were combined into a single score using the following formula:

 (Σ Ownership restrictions) + (2 x Σ Social participation restrictions) + (Σ Economising behaviours) + (2 x Σ Self-rating standard of living) + (2 x Σ Self-rating: satisfaction with standard of living) + (2 x Σ self-rating: adequacy of income)

Based on this procedure scores could theoretically range from 0 to 82. However, it was argued that such a range is not necessarily useful as it produces a very long tail in the distribution without any significant gain in precision. A minimum score of 22 was set, with all responses less than this coded as 22. The majority of responses in this category were regarded as outliers.

To obtain a final score, the range was 're-zeroed' by subtracting 22 from each score, so that the minimum was 0 instead of 22. The maximum was now 60 instead of 82. The reason for this recalculation was purely for presentational purposes, so that a respondent with the lowest possible standard of living had a score of zero. This resulted in the general ELSI scale.

The scores were, henceforth, divided into seven standard score intervals. These intervals represented homogeneous segments of the New Zealand population, based on similar standards of living. The following criteria were used to guide the process (Jensen *et al.*, 2002:92):

- not sacrificing useful discriminating power at the high living standard end of the scale;
- not getting undue bunching into the bottom couple of intervals for sub-populations with low overall living standards;
- having a fairly compact set of ranges, for example, 10 to 15 intervals for the primary set;
- having a secondary set of ranges that is more compact, for example, less than 10 intervals;
- having enough categories in the lower living standard region to permit debates and choices about where poverty thresholds might be specified; and
- a bottom category (the low living standard end) that contains only a small proportion of the population (less than 10 percent).

3.4.2.3 Outcomes of original analysis and further development

An example of the application of ELSI as a segmentation tool is illustrated in Table 9. The results presented indicate the propensity for children in various ELSI segments or categories to experience a constraint in their consumption of the item examined (Jensen *et al.,* 2003:89). For example, 31% of children in the "restricted" category were in families where there was no suitable wet weather clothing for each child because of cost: This in comparison with approximately 7% of children in the "somewhat-restricted" category; 3% in the "comfortable" category; and no children in the "good" living standards category. Constraints on the consumption of child-specific goods and services are experienced by a greater proportion of children with ELSI scores that place them at the lower end of the scale. The ELSI segmentation tool therefore serves as a variable for explaining variation in the data.

Table 9: **Constraints in consumption experienced by New Zealand children by ELSI segments – Items not obtained or cut back because of cost (Jensen *et al.,* 2003:75)**

Items	"Restricted" living standards (levels 1 & 2)	"Somewhat restricted" living standards (level 3)	"Comfortable" living standards (levels 4 & 5)	"Good" living standards (levels 6 & 7)
Suitable wet weather clothing for each child	31%	7%	3%	0%
A pair of shoes in good condition	17%	3%	1%	0%
Child's bike	24%	9%	4%	0%
Playstation	29%	23%	9%	1%
Personal computer	59%	29%	20%	2%
Internet access	59%	30%	19%	3%
Not gone on school outings	51%	23%	7%	1%
Not bought school books/supplies	38%	18%	5%	1%
Not bought books for home	58%	38%	17%	3%
Postponed child's visit to the doctor	31%	13%	3%	0%

3.4.3 The African Response Business Sophistication Measure

3.4.3.1   Background

The development of the African Response Business Sophistication Measure (BSM) emanated from a growing need to provide a more relevant segmentation solution of the various types of entrepreneurs in South Africa (African Response, 2006:9). The measure was to provide an assessment of the degree of sophistication of small businesses. It was also considered a more applicable reference to the condition of a small business than simply referring to 'informal' or 'registered'.

In addition, the BSM was to be used as indicator whether a business was likely to grow or be a user of financial services. This could assist in the effective targeting of policies and services, according to the different needs of South African small businesses.

3.4.3.2   Steps in the index construction

The development of the BSM was carried out in several steps. Survey data obtained from a small business survey conducted in 2006 in Gauteng by Finscope were used by African Response for the development of the measure. The BSM was developed from a wide range of variables measured in the survey. The questionnaire was originally designed as part of the Finscope study, and not with the primary aim of developing an index of sophistication. It was therefore incidental in the context of the African Response study.

The first step, therefore, involved the identification of questions from the Finscope Small Business Survey 2006 questionnaire, which related to the degree of development and sophistication of a small business. The questions chosen were (Galpin, 2006:1):

- What type of business is it?

- Do you sell the goods as you buy them, or do you add value, or both?

- Do you have a written employment contract for your employees?

- What type of premises do you operate your business from?

- Do you own, rent or just use the place where you trade/run your business?

- Services and equipment?

- Partners or shareholders?

- Do you have a written shareholders/partnership/ members' agreement?

- Do you keep financial records or accounts?

- Do you keep these financial records yourself/internally or does someone from outside help you?

- Are your financial records audited?

- Is this business a franchise?

- Is your company/business a subsidiary/part of another company?

- Do you have any affiliations with international companies?

- Do you do any business/trade with anyone outside South Africa?

- Do you import/export/both?

- Do you offer goods or services on credit?

- Type of credit offered?

- Payment of taxes?

- Compliance with Acts?

- Professional services handled by staff?

- Any bank used for the business?

- Type of banking services?

- Do you have any loans for your business?

- From where did you get the loan?

- Types of insurance paid for by the business?

Having identified the questions that could relate to business sophistication, the second step of the development involved the recoding of the questions and subcategories into 126 possible variables, each coded as 1 or 0, depending on whether the respondent responded yes or no. In other words, business

sophistication was gauged by a set of empirical variables that a small business enterprise may or may not have.

The third step of the development involved the subjection of the 126 variables identified to a principal component analysis. The binary coding used placed all the 126 variables on the same scale, making principal component analysis the appropriate technique to be used for index construction (Galpin, 2006:1). The scores obtained from the first principal component analysis formed the initial BSM index scores.

In the fourth step, 10 approximately equally sized BSM groups were derived from the initial index scores, with the size of the groups being in terms of the weighted sample, in other words the population. The means for the variables by groups were henceforth inspected. The analyst found that the number of 'less sophisticated' groups was large. In comparison, there were only one or two groups that were somewhat sophisticated. The scores were then split into 20 groups, and the means again inspected. This investigation revealed that for a number of options, very few respondents stated 'yes'. All with five or fewer respondents were flagged, and considered for omission or combination with other options. In addition, the multi-mentioned options were examined to see which were correlated. For example, the very similar options for the business, namely 'own house/room(s) in own house', 'garage' and 'backyard' were combined into 'own house/room(s) in own house/garage/backyard'. The separate list of banks used was converted to Banked and Unbanked. The loadings on the first factor were also used to group some of the options.

Using the transformed data, a new and final set of index scores was created as part of the fifth step, again using the first principal component initial BSM scores. The scores were categorised into 20 approximately equal-sized groups, with group 1 being the least sophisticated, and group 20 the most sophisticated. As in the case of LSM, the groups were compared in terms of mean index scores as well the proportional distribution of items that formed the basis of the

index. Where adjacent groups were viewed to be similar, groups were combined. A final set of seven BSM segments were formed. The cut-off points used for identifying the seven groups were (Galpin, 2006:2):

Group 1:   Lowest through -0.5086
Group 2:   -0.5086 through -0.4472
Group 3:   -0.4472 through -0.357
Group 4:   0.357 through -0.196
Group 5:   0.196 through 0.0392
Group 6:   0.0392 through 0.8917
Group 7:   0.8917 through highest

3.4.3.3   Outcomes of original analysis and further development

The application of the BSM index as a segmentation tool is illustrated in Figure 8, which shows the estimated proportion of small businesses in Gauteng that have a separate and specific business bank account (African Response, 2006:64). Business bank account penetration in BSM 1 is 0%; while in BSM 4, it is 48%; and in BSM 7 it is 97%. The more sophisticated the business, the higher the banking penetration. This improved an understanding of the behaviour of the market.

Figure 8: **Business bank account penetration in South African small businesses – FinScope Study 2006 (African Response, 2006:64)**
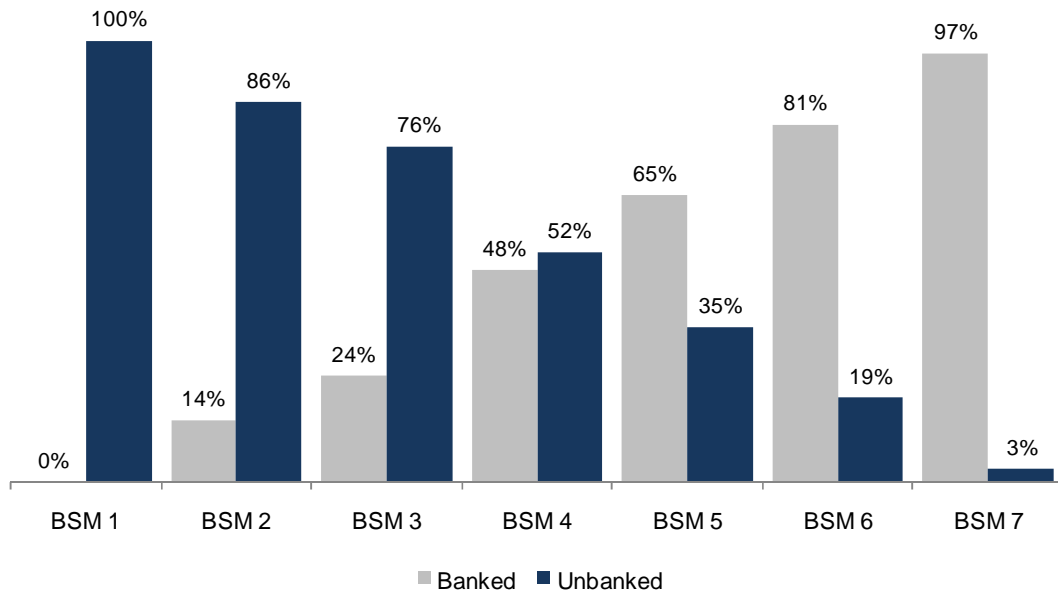
As in the case of LSM, the BSM groups represent homogenised segments in terms of business sophistication. The application of the BSM index as a segmentation tool, therefore, facilitates an improved understanding of market behaviour, which can lead to the identifying of new opportunities, or result in better allocation of the resources.

Having identified and used the seven groups as segmentation base in the 2006 study, the researchers at African Response expressed a need to reduce the number of variables required to accurately predict the index scores that were obtained from the principal component analysis (African Response, 2006:141), thus making it more practical for researchers to reconstruct the index in future studies. The aim was to identify those variables that explained the largest proportion of the variation in the final index scores that were derived from the last principal component analysis. In addition, it was deemed necessary to derive weights that could be added together, giving an indication of where a business was in terms of its level of business sophistication. The outcome

would hence be an instrument for measuring business sophistication in future surveys.

Of the original 126 variables that were used in the construction of the index scores, a subset of 20 variables was identified that played a major role in the equation. These variables were subjected to a stepwise regression that produced a set of estimated BSM scores. It was, however, found that the 20 variables did not correlate sufficiently well with the full BSM index. Further analysis was thus required.

Subsequent stepwise regressions were performed to investigate the performance of subsets consisting of 30, 40 and 50 variables, respectively. The correlations with the full index were: 30 questions ($r = 0.9929$); 40 questions ($r = 0.9957$); and 50 questions ($r = 0.9974$).

The results indicated that although the 40 and 50 variable shortlists seemed to be highly correlated with the full BSM index, the improvement was deemed inadequate to balance the number of questions asked.

The study concluded by presenting a shortlist of 30 questions, from which a 10 group index could be derived. However, no indication of weights was given. The following variables were included on the shortlist:

- Registered for income tax
- Have/use a fax machine
- Marketing and sales
- Compliance with the Employment Equity Act
- Have motor vehicle insurance
- Comply with Pay-as-you-earn (PAYE)
- Have a vision or mission statement
- Have hot running water/geyser
- Have an executive dining room
- Have a photostat/copying machine

- Have an email address

- Internet banking

- Banking – none

- Have a formal training programme

- Workman's compensation

- Have electricity

- Have written agreement

- Audited

- Storeroom/Access to storeroom

- Have a canteen or dining room

- Have Human Resources/Personnel/Payroll

- Comply with Labour Relations Act

- Have a written marketing plan

- Have current or cheque account

- Have pension/provident fund

- Make use of accountant/bookkeeper

- Have a website

- Have contracts for full-time/part-time employees

- Classified as informal/street/market/stall trader (small)

- Have vehicle finance

3.4.4 Key considerations in the construction of a commercial farming sophistication index and applying it as a method of segmentation

The three selective approaches reviewed in the preceding sections provide valid reference and key considerations that are appropriate for index construction in general. More specifically, they serve as reference where the index construction was used as a method of market segmentation. The underlying processes followed are therefore applicable to the construction of a commercial farming sophistication index and applying it as a method of market segmentation.

The considerations pertain, firstly, to the broad aims envisaged for the construction of a specific index that could measure a particular construct. In other words, to measure a variable that cannot be directly observed, but is assumed to exist, based on some pattern of behaviour or combination of characteristics. Secondly, in terms of the assumptions underlying the model adopted that would guide the index construction process. Thirdly, in terms of the steps, processes and advanced statistical methods that could be employed for the calculation of original index scores. Fourthly, in terms of deriving a general use form of the index that could be easily calculated by other researchers and survey practitioners without depending on advanced statistical analysis. Fifthly, to present a standard set of index score intervals that segments the market. Lastly, in terms of the potential value that the index as segmentation variable offers to marketing practitioners in understanding the behaviour of the market. These aspects are discussed next.

3.4.4.1 *Broad aims and objectives envisaged for the construction of a specific index*

It is evident from the review that the construction of the three selective indices all originated from very similar aims and objectives that were envisaged by the various researchers during conceptualisation. Nine specific aims can be identified; and these are listed below. These aims could equally well guide that which was envisaged for the construction of other indices, and more specifically that of a commercial farming sophistication index.

Aim one: To construct an index that is a measure of a specific construct. In other words, to present an index that is one-dimensional. In the case of the SAARF LSM (South Africa) and New Zealand ELSI (New Zealand), this pertained to living standard, while in the case of African Response BSM (South Africa) to that of business sophistication. In the case of this study, the specific construct measured would be that of commercial farming sophistication.

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Aim two: To construct an index using a combination of variables that could measure the construct better than any single variable. The aim of the construction of a commercial farming sophistication index is, therefore, to provide a measure using a combination of variables that could distinguish between the levels of commercial farming sophistication better than any single variable.

Aim three: To construct an index that is a direct measure of the construct, based on non-monetary descriptive indicators. For this study, it would need to relate to measuring commercial farming sophistication without including turnover, profitability or any other monetary-related item as a base for measurement. This aim was adhered to in all three of the reviewed indices. This, however, does not mean that no relationship should exist between the new construct and any monetary-related variable.

Aim four: Items identified for the construction of the index should, on face value, relate to the construct being measured. This suggests that secondary data can be utilised as source for the construction of the index, given that the data is evaluated to be valid in the context of the study.

Aim five: To present an index that is reliable and valid. In other words, the commercial farming sophistication index should measure what it is supposed to measure. This relates to construct validity, which can be decomposed into the assessments of convergent, discriminant and nomological validity. In addition, it should provide scores that are consistent across repeated measures. This relates to the reliability of measurement.

Aim six: To construct an index that has broad application value across the full spectrum of the market, allowing for sub-group analysis, including examination of individual groups and comparisons between groups. A similar aim was

envisaged for this study, namely, to construct an index that could discriminate across the full continuum of commercial farming businesses in South Africa.

Aim seven: To present a measurement process that is useful in future surveys from which separate samples are drawn. In other words, the calculation of index scores should be a simple procedure, and easily replicated by a wide range of researchers and survey practitioners across other surveys conducted in the market. Scores should be readily interpretable.

Aim eight: To construct an index that is stable over time, but sensitive enough to register changes. In other words, to provide scores that would make trend analysis possible. This is, however, only achieved through continuous revision and refinement of the index over time, which was reported as being part of the processes in the reviewed indices, in particular that of the SAARF LSM and New Zealand ELSI scales.

Aim nine: To present a standard set of index score intervals that segments the market. These intervals will provide a practical and standardised procedure that other researchers can follow in future to segment the market.

3.4.4.2   Assumptions and model

In order to achieve the stated aims, three key assumptions underlie the index construction process, namely, that the measured construct can be:

- Presented by a single underlying continuous dimension that is the source of the associations between a number of observable variables;
- Could be ranked along a continuum, reflecting levels of the measured construct; and
- Used as base of descriptor variable in market segmentation studies.

3.4.4.3 Steps, processes and methods employed for calculation of original index scores

The stepwise process followed in the construction of all three of the measures, namely, the SAARF LSM, New Zealand ELSI scale and the African Response BSM correspond to the multi-level approach proposed by both Babbie (2011:171) and Spector (1992:7) in index construction. The steps can broadly be specified as: (1) Item selection and the defining of variables for further analysis; (2) combining variables into an index; and (3) segmentation and validating the index.

Drawing from the review, the selection of items of variables included in the calculation of the original index scores is evaluated in terms of their contribution to measuring and explaining the construct under consideration. It is, therefore, considered critical to assess an item's capacity to offer discriminating power across the continuum. This is typically done in part through the determining of the face validity of items.

Next, it is evident that the use of multivariate statistical techniques, such as principal component analysis and confirmatory factor analysis (CFA) provide powerful tools that could aid in the calculation of original index scores. In fact, when a binary coding system is used to indicate the presence of selected items as part of construct measurement, it places all variables on the same scale, making principal component analysis the appropriate technique to be used for index construction (Galpin, 2006:1). Both techniques, however, reduce the often large number of variables into fewer and more meaningful constructs or factors that can be interpreted.

Lastly, index validation should take place. This involved, in the case of the three reviewed indices, examining the association of the derived index scores against those variables and items that comprise it, as well as other variables that could be expected to be associated with the construct.

3.4.4.4 Derivation of a general use form of the index scale

Resulting from the above three steps, index scores are produced that might not necessarily be easily replicable in future studies. Due to the typically large number of variables that are used in the original index construction, a reduction of the number of explanatory variables is sought. This is achieved by identifying those variables that have the greatest discriminatory power, and then weighing them optimally. This produces a general-use form of the index that could be easily calculated by other researchers and survey practitioners without depending on using advanced multivariate statistical techniques.

Weighting is done in such a way that each variable carries a different weight, positive or negative. An element's position on the index scale could then be derived by adding together the calculated weights of the variables. In some instances, a constant is also added to the total score to remove negative total scores.

3.4.4.5 Applying the index as a method of market segmentation

This relates to specifying standard intervals of the index scores, which then represents homogeneous segments of the market. In all of the cases, the process of establishing cut-points for the intervals was informed by the calculation of some basic descriptive statistics, as well as adhering to criteria specified by the researchers. The forming of groups was thus not based on an advanced statistical clustering method of index scores.

3.4.4.6 Application value of index

It is evident from the review that the three derived indices offered extensive value to practitioners, in particular as a method of market segmentation. The antecedents of market segmentation were extensively discussed in Section 2.5,

and apply to these three approaches also. These include aspects, such as a better understanding of the market, assisting in the design of more suitable marketing strategies and programmes, helping businesses focus on those buyers that have the greatest chance of being satisfied, as well as identifying new marketing opportunities, and the more effective allocation of financial and other resources.

In support of this, it was noted that the SAARF LSM is considered to be one of the most widely used marketing research tools in Southern Africa (Haupt, 2006:1).

3.5   CHAPTER SUMMARY

In this chapter, the construction of an index was described by drawing on a sequential three-step process, which was also adopted for this study. The steps involved: firstly, item/variable selection; secondly, examining the empirical relationships between variables and the combining of items into an index; and thirdly, validating the index. When applying the index as segmentation variable it forms part of the last step. The chapter also considered a number of selective studies, in particular due to the fact that these studies followed a process of index construction and applying it as a method of market segmentation. From the review some key considerations could be drawn that were deemed highly relevant in the construction of a commercial farming sophistication index and subsequent segmenting of the market.

The next chapter will provide a discussion of the research design and methods employed in this study.

CHAPTER 4: RESEARCH DESIGN AND METHODS

4.1   INTRODUCTION

This chapter provides a description and motivation for the research design and the methods used in this study. Aspects relating to the inquiry strategy and broad research design are, firstly, depicted in the section that follows. This is followed by a discussion of the data source utilised, the sampling and data analysis plan employed. The latter part of the chapter reflects on assessing and demonstrating the quality and rigour of the research design. Lastly, ethical considerations applicable to this study are addressed.

4.2   DESCRIPTION OF INQUIRY STRATEGY AND BROAD RESEARCH DESIGN

The following sections provide, firstly, a description of the study's general strategy of inquiry. This is followed by the basic characteristics associated with quantitative research. Lastly, a classification of the study's overall research design is presented.

4.2.1   <u>A description of the study's strategy of inquiry</u>

To investigate and illustrate the process of index construction and applying it as a method of market segmentation, this study utilised secondary data that were originally gathered during a survey by an independent market research organisation amongst a sample of commercial farming businesses in South Africa. A structured questionnaire was used as data gathering instrument. From the questionnaire, items were identified that on face value were believed could contribute to constructing a particular index of commercial farming sophistication. In the context of this study the availability of the data, as well as

the original questionnaire used and sampling frame targeted during the survey, are therefore considered incidental and serves solely to illustrate the process of index construction as a method of market segmentation. The strategy of inquiry is described as quantitative.

4.2.2 The basic characteristics of quantitative research

Quantitative research, in general, involves data gathering in their primary form from large numbers of individuals or sample elements, with the intention of extrapolating the results to a wider population (Tustin *et al.*, 2005:89). More specifically, quantitative research is associated with numbers as the unit of analysis with the aim of measuring or describing phenomena (Denscombe, 2007:248). When such raw, unanalysed quantitative data becomes available for re-analysis by other researchers it constitutes secondary data. Coyer & Gallo (2005:60) describe secondary data analysis as a method where data collected in another study is used to answer new research questions or use different statistical techniques.

4.2.3 A classification of the study's overall research design

The broad research design of this study can best be described by the following descriptors:

- *Empirical research:* The study analysed secondary numeric data, and can therefore be classified as an empirical study.

- *Basic research:* The aim of basic research is concerned with the advancement of theoretical conceptualisations about a particular topic (Leedy & Ormrod, 2010:44). This study was undertaken to investigate the process of index construction and applying it as method of market segmentation. This is illustrated through the construction of a commercial farming sophistication index and using it to segment the market into homogeneous groups.

- *Descriptive research:* According to Leedy and Ormrod (2010:182), descriptive quantitative research involves either identifying the characteristics of a certain observed phenomenon, or exploring possible associations among two or more phenomena. This is accomplished by examining a phenomenon, namely that of index construction and its application as a method of market segmentation, and by describing important factors associated with this process (Kelley, Clark, Brown & Sitzia, 2003:261).

- *Non-experimental:* This study did not involve changing or modifying the situation being researched, nor to determine cause-and-effect relationships (Leedy & Ormrod, 2010:182).

- *Cross-sectional:* Descriptive quantitative research is mostly concerned with the measurement at a single point in time (Kelley *et al.*, 2003:261). The original design of the survey by MSSA was cross-sectional, having gathered the data over a specific period in the latter part of 2009.

- *Secondary data:* The data utilised in this study were originally gathered during 2009 by an independent research company and further analysed as part of the process of index construction. In the context of this study the secondary data is, however, regarded an incidental source to illustrate the process of index construction and market segmentation.

4.3   SOURCE OF DATA

This section describes how, when, where, and by whom the secondary data used in this study were originally collected. The last section lists the specific questions that were identified from the original survey questionnaire for use in this study.

4.3.1 Data gathering

The data were originally gathered during 2009 by an independent research company, Marketing Surveys and Statistical Analysis (MSSA), amongst a sample of commercial farming businesses across all provinces of South Africa. A survey methodology was employed to guide the data collection process.

A structured questionnaire served as data-collection instrument. This means of data collection is well-suited for collecting data that can be quantified and used to describe the activities and conditions in commercial farming businesses pertaining to levels of sophistication.

Questionnaires were sent out via mail to the selected sample units, as identified from the sampling frame used by MSSA. A personalised covering letter explaining the purpose of the research: that participation is voluntary, ensuring confidentiality and related issues, accompanied the questionnaire. The respondents were requested to complete the questionnaire and return it by a certain date. A self-addressed, stamped return envelope was also included for the convenience of the respondent.

4.3.2 **Questionnaire design**

The questionnaire used during the original survey was developed with the aim of describing the commercial farming market in South Africa in terms of selective firmographic characteristics as well as certain behavioural aspects of the business. This included investigating structures, systems, strategies and practices employed across various functional areas in the farming business.

4.3.3 **Question identification**

While the intention of the 2009 survey was not to construct an index of commercial farming sophistication, it offered sufficient scope for the

construction of such a construct. The researcher identified a number of possible questions that were believed could contribute towards measuring farming sophistication or could be used to validate the index and derived market segments. The questions identified were:

- What is the primary farming operation (main source of income) of this farming business?
- What are the secondary branches of farming operations?
- What is the total size of the farms being managed by the farming business?
- What percentage of total income is obtained from other farming-related operations?
- What percentage of total income is obtained from other non-related farming operations?
- What is the annual total turnover of all farming activities?
- How is the primary farming business administrated?
- Does the farming business complete and submit VAT returns?
- Does the farming business manage a cash-flow budget?
- Does the farming business make use of an external/independent accountant to keep financial records?
- Does the farming business make use of any external/independent financial advisor (other than accountant)?
- Does the farming business make use of cell-phone(s) as part of managing and operating the farming operations?
- Does the farming business make use of any 3G cellular services as part of the farming business?
- Does the farming business make use of a PC as part of the farming business?
- Please indicate what the PC is used for as part of the farming business?
- Does the farming business have access, or plan to have access to the Internet in the nearby future?
- What is the main method of paying wages and salaries?
- Indicate the types of insurance paid for by the farming business?

- Does the active farmer have any agricultural related qualifications?
- What is the highest educational level of the active farmer?
- Does the active farmer have an updated will?
- Which medical insurance products has the active farmer made provision for?
- How often does the active farmer review his/her estate planning?

The data reflecting the responses related to these questions were made available to the researcher for further analysis as part of this study. Procedures and methods employed to standardise the data into a suitable format for index construction and segmentation are dealt with in Section 4.5.1.

4.4   SAMPLING

In practice, it is seldom possible to study all the members of a population that is under consideration (Thompson, 2012:1). The availability of population elements at a single time, as well as budget and time constraints, requires the use of a sample – in order to study a sample of the population. This approach was used during the sampling design of the original study. The sections that follow consider the units of analysis and observation that applied to the original survey and equally apply to the current study. The sampling frame of the original survey is subsequently defined. This detail is provided as background to the secondary data utilised in this study. Of particular importance is the sample size that was available for the current study. It is evaluated against recommended sample sizes needed for index construction.

4.4.1   Units of analysis and units of observation

Units of analysis refer to those elements that are examined, in order to create summary descriptions of all such units (Babbie, 2011:101). In the original survey the unit of analysis was defined as a commercial farming business, and

was subsequently defined similarly for the current study. In some studies, however, the units of analysis do not coincide with the units of observation, with the latter representing those elements from which the data is collected about the unit of analysis. This was the case in the original survey, with the active farmer or farm manager being targeted to provide information on the farming business.

4.4.2 Sampling frame

Although the data collected during the original survey are considered incidental in the context of this study and serves as a valid quantitative basis for index construction, the sampling frame defined as part of the original survey is briefly noted for background purposes.

A mailing list that contained the postal addresses of about 4 500 commercial farming businesses located in South Africa constituted the sampling frame of the original survey. Questionnaires were mailed to these businesses, with a total of 876 completed and valid responses received by the cut-off date. This represented an approximate response rate of 19.4%.

4.4.3 Sample size required for index construction

A number of recommendations are made in the literature regarding the minimum sample size needed when constructing an index variable. However, there seems to be a lack of agreement in this regard, with suggestion ranging between a minimum sample of 150 proposed by Hinkin (1995:973) and 300 proposed by Clark and Watson (1995:12).

The available sample database of 876 records formed the point of reference for the construction of the sophistication index and subsequent segmentation. The research design adopted for this study specified the splitting of the sample database into two sub-sets. One set was to be used for the construction of the

index, while the other would serve as a holdout sample for use as part of evaluating the reliability of measurement. The generating of the two samples was done by means of a randomised split of the original sample, while specifying the appropriate sub-sample sizes needed in each data set. Of the 876 cases in the original sample database, 600 were randomly allocated to the development sample, with the remaining 276 being allocated as holdout sample. The sample of 600 allocated for the index construction therefore met the minimum requirement of 300 suggested by Clark and Watson (1995:12).

4.5   DATA ANALYSIS

Aspects relating to the standardisation of the measurement scales are discusses, followed by a presentation of the data analysis plan for constructing the index and segmenting the market. A statistical software package, IBM SPSS (Version 20) was used for data analysis.

4.5.1   Standardisation of measurement scales

The response categories of all the questions identified from the 2009 survey were coded, so that the categories would be represented by a number of dichotomous (binary) variables, indicating the presence or absence of a specific item within the commercial farming business. The scoring system specified a zero for the absence of an item, and a one for the presence of the item. This, firstly, standardised the scale across all variables; and secondly, it met the measurement requirements for principal component analysis, which were used as part of the index construction.

4.5.2   Data analysis plan for constructing of the index

The following data analysis plan provided the guidelines for the analysis of the data in order to construct the sophistication index and apply it as a method of

market segmentation. The plan followed a multi-step approach, namely: (1) Selecting of items and defining of variables that are most likely to be indicators of commercial farming sophistication; (2) combining of variables into an index; and (3) segmentation and validating of the index.

The words 'item' and 'variable' are often used interchangeably. In this study, these two concepts have an identical meaning. A variable or item more specifically captures the presence or absence of an item in a commercial farming business.

As noted in Section 4.4.3, the sample of 876 was divided randomly into two groups of 600 and 276, respectively. The construction of the index was done on the sample of 600, while the remaining 276 were used as holdout sample to support index and segment validation.

During the first step, one-way frequency tables were produced based on the sample of 600. Frequency tables provide a proportional distribution of the various dichotomous variables, indicating the percentage of commercial farming businesses where a particular item is present. This is an important preliminary step in the process of index construction, as Babbie (2011:173) emphasises. Only variables that show sufficient variation should be used in the subsequent steps of the index construction process.

Step two involved examining the empirical relationships between the variables. The data analysis was performed as follows:

- Subjecting of the identified variables from step one to an exploratory factor analysis. More specifically, a principal component extraction method was used. Principal component analysis is a technique for finding relationships in multivariate data, with the aim of reducing the dimension of the data without serious loss of information (Porkess, 2004:193). The employment of this data-reduction technique is also supported by Galpin (2006:1), who noted that binary variables place all variables on the same scale, thus

making principal component analysis the appropriate technique to be used for index construction. The scores on the factor that explained the largest proportion of variation in the data formed the initial scores for the index. These scores, or factor loadings, are continuous with a normal distribution, and are typically standardised with a mean of zero and a standard deviation of one.

- The scores were then categorised into 10 equal-sized groups. Inspection of frequency distributions and correlation analysis provided insight into the extent of association amongst the variables and the initial index scores. Variables that showed no or little correlation were excluded from the subsequent analysis.

- A second principal component analysis was performed using the reduced list of variables as input. The scores from the factor that explained the largest proportion of variation in the data were subsequently included in a stepwise regression as dependent variable to identify a set of variables that would help explain any variation in the index scores. Stepwise regression analysis is a multivariate technique that identifies from a set of independent variables, those variables that best predict the dependent variable (Leedy & Ormrod, 2010:282). The new set of scores produced by the stepwise regression was correlated with the scores derived from the second principal component analysis. The scores from the stepwise regression formed the final commercial farming sophistication index. It should be noted that the variables included in the final stepwise regression model were not necessarily only those identified from the second principal component analysis.

- In order to form a final set of commercial farming sophistication segments, the scores from the stepwise regression were categorised into a number of equally sized groups. The proportional distribution of variables across the groups was examined, and where the proportions were similar, adjacent groups were combined. The forming of segments were thus guided by some basic statistical analysis and criteria specified by the researcher.

- Forming of segments. Lower and upper cut-off points were identified for each segment, providing segmentation rules for researchers and practitioners.

The last step in the analysis involved the segmentation and validation of the index. Validity was confirmed by firstly examining the relationship between segments across those variables that comprise it; and secondly, amongst other variables that were expected to also be correlated with the levels of sophistication.

4.6   ASSESSING AND DEMONSTRATING THE QUALITY AND RIGOUR OF THE RESEARCH DESIGN

This section considers issues relating to assessing the quality of the secondary data used as part of this study. It also addresses issues of reliability of measurement, particularly concerning the construction of the commercial farming sophistication index. The last section deals with validity of measurement.

4.6.1 Quality of secondary data

When utilising secondary data as part of a study, it is important to assess if the data are sufficient to address the research objectives (Tustin *et al.* 2005:132). In other words, an evaluation of the accuracy of such data is an essential step in the design of the study. This includes evaluating the source of the data and the quality of the data.

Coyer and Gallo (2005:62) talk about both practical and methodological issues that should be evaluated when a researcher chooses to conduct an analysis of secondary data. Firstly, the investigator must check for the fit between the original data and the new research questions. In the case of the current study, the aim of the original study was to gather data to profile the commercial

farming market in South Africa in terms of selective firmographic characteristics as well as certain behavioural aspects of the business, which included investigating the structures, systems, strategies and practices employed across various functional areas in the farming business. The construction of a sophistication index was therefore not one of the original outcomes envisaged. However, the secondary data were evaluated by the researcher to be suitable for the construction of such an index. This judgement was based on criteria that included the identification of variables that the researcher believed could contribute towards measuring farming sophistication. The question formats were such that standardisation of data was possible, which was a necessity for employing certain advanced statistical techniques as part of index construction. A fit therefore existed between the original data and the new research question.

Secondly, the operational definitions of the variables used in the original study should be applicable and relevant to the requirements of the current study. With the secondary data serving as incidental source for illustrating the process of index construction as a method of market segmentation, the definitions concerning units of analysis as well specific variable definitions were adopted for the current study.

Thirdly, the original data should be evaluated in terms of sample selection bias. Sampling bias may be defined as a condition that disturbs the randomness by which a sample is selected (Leedy & Ormrod, 2010:215). Forza (2002:164) also notes that poor sample design affects the generalisability of the results. In the original study, a mail survey was used to gather the data, where potential respondents were identified from a list that contained the postal addresses of about 4 500 commercial farming businesses located in South Africa. The sampling employed was judged to be a non-probability method, which typically restricts generalisation to the population. Exploratory analysis conducted by MSSA found that the sample data were suitable for weighting to reflect population estimates (MSSA, 2009:8). According to Statistics South Africa (2009:10), there were an approximate 39 000 commercial farming businesses in

South Africa in 2007. Other characteristics released by Statistics South Africa indicated the proportional distribution of the population across province, size of farming businesses, type of primary farming activity and how farming businesses are administered. A set of weights were calculated by MSSA so that the original sample would reflect the approximate 39 000 commercial farming business population as well as corresponding firmographic characteristics. This process would contribute towards reducing some of the sampling bias.

4.6.2 Reliability

Reliability is concerned with the accuracy and precision of a measurement procedure (Cooper & Schindler, 2003:231). In other words, a measure is considered reliable if it yields consistent results. A measure that is stable produces consistent results – with repeated measurements of the same target population and same instrument. Cooper and Schindler (2003:238) acknowledge that this is a difficult task in survey research – due to time and financial constraints when surveying the same population twice.

As was noted in Section 4.4.3, the available sample database of 876 records was split into two sub-sets, with one set used for the construction of the index, while the other served as holdout sample to evaluate the reliability of measurement. In other words, the aim was to check if similar results could be obtained when applying the outcomes from the index construction and segment formation on a separate independent sample.

Lastly, the set of weights that were calculated for the original sample to reflect Statistics South Africa population estimates, were adjusted by MSSA for the two sub-samples. Although not specified as a requisite in general for index construction, being able to present the size of each market segment based on estimated population numbers offer significant value for marketing practitioners in establishing the purchasing power and potential profits of a segment. This is also one of the key success factors of a market segmentation study and is

referred to as the measurability of market segments (Canever *et al.*, 2007:514; Freathy & O'Connell, 2000:103). This aspect is noted and illustrated in Chapter 5 as part of presenting the results.

4.6.3 <u>Validity</u>

Cooper and Schindler (2003:231) distinguish between two main forms of validity, namely: external and internal. External validity is concerned with the representativeness and generalisability of the results. This is largely addressed by the sampling process, and already covered in the preceding section. Internal validity looks at the ability of the measurement to measure what it is supposed to measure. Two specific forms of validity are relevant in studies where constructs are measured: content and construct validity.

Content validity considers the extent and appropriateness with which the variables provided adequate coverage of the investigative construct. Construct validity addresses the question of what is actually measured. Determination of both the content and construct validity is crucial (Cooper & Schindler, 2003:232). While the researcher identified variables from the original survey that he believed could contribute towards measuring farming sophistication, this constituted face validity. For the purpose of this study though, ensuring face validity was deemed sufficient. Future research studies might be considered where the content and construct validity of commercial farming sophistication be established.

4.7 ETHICAL CONSIDERATIONS

A number of ethical issues pertaining to this study were considered and adhered to.

- *Right to privacy and confidentiality.* This study utilised secondary data and access to personal details regarding the original survey participants were restricted. This eliminated compromising an individual's confidentiality.

- *Use of data source:* Approval was granted by MSSA to use the secondary data in further analysis with the aim of constructing an index of commercial farming sophistication. Ethical clearance was also obtained from the University of Pretoria regarding the use of the secondary data.

- *Use of the findings:* The results of this study are to be used for academic purposes only and may be published in an academic journal.

4.8 CHAPTER SUMMARY

This chapter provided a discussion of the research design and methods employed in this study. Aspects relating to data source utilised, the sampling and data analysis plan employed were addressed. The next chapter will provide a discussion of the research results, with the focus on index construction and its application in segmenting the commercial farming market.

CHAPTER 5: RESEARCH RESULTS

5.1   INTRODUCTION

This study set out to investigate and illustrate the process of index construction as a method of market segmentation. The results pertaining to the construction of such an index, namely one that measures the levels of commercial farming sophistication, as well as the processes followed to segment the market are reported in this chapter. The construction of the sophistication index utilised secondary data that were originally collected by Marketing Surveys and Statistical Analysis. The construction of the index was based on a sub-sample of 600, while the remaining sample of 246 served as holdout for index and segment validation.

5.2   INDEX CONSTRUCTION AND SEGMENTATION

The data analysis followed a multi-step approach, namely: (1) Item selection and defining of variables that are most likely to be indicators of commercial farming sophistication; (2) combining of variables into an index; and (3) segmentation and validating of the index. The sections that follow report the results for each of these steps.

5.2.1   <u>Step 1: Item selection and standardisation of measurement scales</u>

The response categories of all the questions identified from the 2009 survey were coded, so that the categories would be represented by a number of dichotomous (binary) variables, indicating the presence or absence of a specific item within the commercial farming business. The first step of index construction, however, involved the identification specific binary variables that were believed could contribute towards measuring farming sophistication.

Following the identification of these variables, one-way frequency tables were produced using the unweighted data set (n = 600). Only variables that showed sufficient variation were used in the subsequent steps of the index construction and are reported in Table 10.

Table 10:   Frequency distribution of initial set of variables (n = 600)

Variables	No	Yes
Primary farming operation: Stock farmer	33.0%	67.0%
Have any secondary branches of farming operations	24.0%	76.0%
Operate other farming-related business	78.7%	21.3%
Primary farming operation administrated: Sole Ownership	33.8%	66.2%
Registered for VAT	3.2%	96.8%
Have cash-flow budget	27.0%	73.0%
Make use of accountant (external)	71.7%	28.3%
Use a cell-phone as part of farming operations	8.7%	91.3%
Use PC as part of farming business/farm management	27.2%	72.8%
Use PC for business management	68.5%	31.5%
Use PC for animal/irrigation management	75.2%	24.8%
Use PC for financial management	57.5%	42.5%
Use PC for VAT/tax management	60.7%	39.3%
Have Internet access	38.8%	61.2%
Pay wages via Internet	71.0%	29.0%
Have short-term insurance for farming business	12.3%	87.7%

5.2.2 Step 2: Combination of the variables into an index

Step two involved the statistical process of combining variables into an index by examining the empirical relationships between them. Various inter-relating sub-steps are distinguished and these will be discussed in the sections that follow.

5.2.2.1   Step 2.1: First principal component analysis

Firstly, the data derived from the identified variables from step one were subjected to a principal component analysis. The scores on the factor that explained the largest proportion of variation in the data formed the initial scores

for the index. These scores, or factor loadings, are continuous with a normal distribution, and are typically standardised with a mean of 0 and a standard deviation of 1.

The results obtained from the principal component analysis are reported in the tables below. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy shown in Table 11 represents an index value for comparing the magnitudes of the observed correlation coefficients with the magnitudes of the partial correlation coefficients. Pallant (2010:183) recommends a minimum value of 0.6 for a good analysis. A high value, such as the 0.82 reported in Table 11, is indicative of the fact that the correlations between pairs of variables can mostly be explained by other variables. This result suggests that one could continue with the analysis.

A further indication of whether the data used are considered suitable for such an analysis is the result of Bartlett's test of sphericity (Pallant, 2010:183). This test is used to test the hypothesis that the correlation matrix is an identity matrix. In other words, that all the diagonal terms are one and all off-diagonal terms of zero. If the resulting correlation matrix is considered an identity matrix, continuing with a principal component analysis is not advisable. However, the *p*-value of 0.000 reported in Table 11 suggests that the null hypothesis can be rejected and that the correlation matrix yielded coefficients large enough to help explain variation in the data, and assist in identifying any underlying emerging factors.

Table 11: **Results from first principal component analysis - KMO measure of sampling adequacy and Bartlett's test of sphericity**

Kaiser-Meyer-Olkin measure of sampling adequacy		0.820
Bartlett's test of sphericity	Approximate Chi-Square	1 657.72
	Degrees of freedom	120
	Sig.	0.000

Table 12 shows that the first factor from the analysis captured the highest proportion, namely 21.0% of the variability in the data. This is in comparison slightly higher than the 19.7% obtained from the corresponding first step during the construction of the African Response Business Sophistication Measure (African Response, 2006:21); and this was, accordingly, considered to be a positive indication of the potential for index construction.

Table 12:   Results from first principal component analysis - Variance explained

Factor	Rotation sums of squared loadings		
	Total	% of variance	Cumulative %
1	3.368	21.0%	21.0%
2	1.351	8.4%	29.5%
3	1.291	8.1%	37.6%
4	1.171	7.3%	44.9%
5	1.108	6.9%	51.8%

Seven of the 16 variables subjected to the analysis were more closely related with the first factor, forming the basis of the newly created index. The factor loadings of these seven variables are listed in Table 13.

Table 13:   Results from first principal component analysis – variables loading on first factor

Variables	Factor loadings
Use PC as part of farming business/farm management	0.786
Have Internet access	0.734
Use PC for financial management	0.734
Use PC for VAT/tax management	0.651
Use PC for business management	0.634
Pay wages via Internet	0.611
Use PC for animal/irrigation management	0.550

Lastly, reporting of the Cronbach alpha value provides a means for evaluating the internal reliability consistency of the newly created index. Pallant (2010:97) suggests that ideally, the coefficient should be above 0.7. An alpha value of

0.813 was reported, which is indicative that the seven variables forming the basis for deriving the initial scores for the index could be considered highly internally reliable.

5.2.2.2 Step 2.2: Distilling of variables for further analysis

The scores obtained from the first factor were, subsequently, categorised into 10 equally sized groups. Inspection of the frequency distributions (refer to Table 14) and results from a correlation analysis (refer to Table 15) provided insight into the extent of association amongst the variables and the initial banded index groups.

Table 14:   Percentage frequency distribution of initial set of variables by 10 banded groups (n = 600)

Variables	Group:									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Primary farming operation: Stock farmer	63.1%	89.1%	83.6%	54.2%	70.0%	56.7%	73.8%	55.0%	50.8%	75.0%
Have any secondary branches of farming operations	96.9%	50.9%	60.7%	79.7%	83.3%	71.7%	83.6%	83.3%	78.0%	68.3%
Operate other farming-related business	13.8%	10.9%	6.6%	30.5%	23.3%	23.3%	21.3%	30.0%	32.2%	21.7%
Primary farming operation administrated: Sole Ownership	86.2%	76.4%	91.8%	54.2%	70.0%	61.7%	60.7%	56.7%	50.8%	51.7%
Registered for VAT	89.2%	98.2%	95.1%	94.9%	98.3%	96.7%	96.7%	100.0%	100.0%	100.0%
Have cash-flow budget	80.0%	54.5%	55.7%	66.1%	66.7%	80.0%	82.0%	70.0%	89.8%	83.3%
Make use of accountant (external)	18.5%	45.5%	24.6%	22.0%	13.3%	28.3%	31.1%	18.3%	35.6%	48.3%
Use a cell-phone as part of farming operations	76.9%	80.0%	86.9%	93.2%	100.0%	96.7%	98.4%	93.3%	93.2%	95.0%
Use PC as part of farming business/farm management	-	-	32.8%	96.6%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Use PC for business management	-	-	-	11.9%	15.0%	35.0%	36.1%	48.3%	81.4%	88.3%
Use PC for animal/irrigation management	-	-	-	8.5%	23.3%	18.3%	32.8%	35.0%	45.8%	85.0%
Use PC for financial management	-	-	-	15.3%	25.0%	55.0%	60.7%	81.7%	91.5%	96.7%
Use PC for VAT/tax management	-	-	1.6%	18.6%	38.3%	45.0%	49.2%	71.7%	76.3%	93.3%
Have Internet access	-	1.8%	19.7%	64.4%	70.0%	76.7%	86.9%	95.0%	98.3%	100.0%
Pay wages via Internet	-	-	3.3%	3.4%	10.0%	25.0%	47.5%	51.7%	66.1%	83.3%
Have short-term insurance for farming business	100.0%	94.5%	52.5%	94.9%	88.3%	90.0%	88.5%	88.3%	91.5%	88.3%

Variables that showed no or little correlation (where p-value > 0.05) were excluded from subsequent analyses.

Table 15: **Correlation analysis of initial set of variables by banded group – Spearman's rho (n = 600)**

Variables	Correlation coefficient	Sig.
Primary farming operation: Stock farmer	-0.089	0.029
Have any secondary branches of farming operations	0.007	0.865
Operate other farming-related business	0.131	0.001
Primary farming operation administrated: Sole Ownership	-0.244	0.000
Registered for VAT	0.143	0.000
Have cash-flow budget	0.154	0.000
Make use of accountant (external)	0.088	0.031
Use a cell-phone as part of farming business	0.187	0.000
Use PC as part of farming business/farm management	0.763	0.000
Use PC for business management	0.635	0.000
Use PC for animal/irrigation management	0.535	0.000
Use PC for financial management	0.734	0.000
Use PC for VAT/tax management	0.649	0.000
Have Internet access	0.725	0.000
Pay wages via Internet	0.614	0.000
Have short-term insurance for farming business	0.018	0.654

5.2.2.3   Step 2.3: Second principal component analysis

A second principal component analysis was performed using the reduced list of variables as input. The scores on the first factor, which explained the largest proportion of variation, formed a second set of initial scores that could be used for the construction of the final index values as part of step 2.4.

Table 16 reports a Kaiser-Meyer-Olkin measure of sampling adequacy of 0.825 and a significance value of 0.000 for Bartlett's test of sphericity. Both these results are indicative that the data are suitable for principal component analysis.

Table 16: **Results from second principal component analysis - KMO measure of sampling adequacy and Bartlett's test of sphericity**

Kaiser-Meyer-Olkin measure of sampling adequacy		0.825
Bartlett's test of sphericity	Approximate Chi-Square	1 578.37
	Degrees of freedom	91
	Sig.	0.000

The first factor from the second principal component analysis captured 24.3% of the variability in the data, as shown in Table 17. This is higher than the 21.0% obtained from the first factor of the first principal component analysis, and is an improvement to the extent that the variables explain the overall variation in the data.

Table 17: **Results from second principal component analysis - Variance explained**

Factor	Rotation sums of squared loadings		
	Total	% of variance	Cumulative %
1	3.400	24.3%	24.3%
2	1.429	10.2%	34.5%
3	1.145	8.3%	42.7%
4	1.077	7.7%	50.4%

Seven of the 14 variables subjected to the analysis were associated significantly with the first factor. The factor loadings are shown in Table 18.

Table 18: **Results from second principal component analysis – variables loading on first factor**

Variables	Factor loadings
Use PC as part of farming business/farm management	0.820
Have Internet access	0.760
Use PC for financial management	0.719
Use PC for VAT/tax management	0.665
Pay wages via Internet	0.602
Use PC for business management	0.586
Use PC for animal/irrigation management	0.531

5.2.2.4 Step 2.4: Stepwise regression and deriving of the final index scores

While steps 2.1 to 2.3 assisted in the deriving of various sets of initial scores for representing levels of commercial farming sophistication, step 2.4 is concerned with deriving of a final set of index scores, as well as identifying a final set of variables that best explains the variation in the scores. The final outcome of this step would be a mathematical equation that would allow researchers to calculate scores for the commercial farming sophistication index.

In order to derive the equation and calculate the relevant weights, the scores from the first factor obtained from the second principal component analysis were subsequently subjected to a stepwise regression. Using the weighted sample to represent population estimates, the scores were specified as dependent variable, while the original set of 16 variables served as predictor variables. This resulted in a new set of scores. As expected, the new set of scores produced by the stepwise regression correlated highly with the scores from the second principal component analysis, with an adjusted R-square of 0.995 as shown in Table 19. The adjusted R-square provides an indication of the percentage variation explained in the data by the regression function, when adjusting for the number of predictor variables. A value of 1 is indicative of a perfect fit.

Table 19:   Results from stepwise regression - Model summary

R	R Square	Adjusted R Square	Standard error of the estimate
0.997	0.995	0.995	0.07021459

The analysis of variance (ANOVA) was used to test the hypothesis that the coefficients included in the final model were significantly different from zero. The results, as reported in Table 20, show that the null hypothesis cannot be

accepted (p = 0.000), suggesting, therefore, that all the coefficients are significantly different from zero.

Table 20:   Results from stepwise regression - ANOVA

	Sum of squares	Degrees of freedom	Mean square	F	Sig.
Regression	38 254.734	10	3 825.473	775 944.167	0.000
Residual	192.219	38 989	0.005		
Total	38 446.953	38 999			

The predicted scores calculated from the stepwise regression also formed the values for the final commercial farming sophistication index. It should be noted that the variables included in the final stepwise regression model were not necessarily the same as those identified from the second principal component analysis. The variables, which best predicted the index scores associated with commercial farming sophistication, are reported in Table 21.

Table 21:   Results from stepwise regression - Coefficients

	Unstandardised coefficients		Standardised coefficients		
	B	Standard error	Beta	t	Sig.
Constant	-2.148	0.002		-906.173	0.000
Use PC as part of farming business/farm management	0.586	0.001	0.263	472.160	0.000
Use PC for financial management	0.400	0.001	0.200	422.913	0.000
Pay wages via Internet	0.369	0.001	0.165	390.553	0.000
Use PC for VAT/tax management	0.515	0.001	0.254	590.748	0.000
Use PC for animal/irrigation management	0.470	0.001	0.207	525.594	0.000
Have Internet access	0.431	0.001	0.212	397.098	0.000
Primary farming operation: Stock farmer	0.300	0.001	0.145	390.479	0.000
Use PC for business management	0.277	0.001	0.129	301.476	0.000
Use a cell-phone as part of farming business	0.303	0.001	0.085	230.231	0.000
Registered for VAT	0.305	0.002	0.055	151.241	0.000

In conclusion then, the following equation with coefficients is derived for the calculating of index scores:

Equation 1:   Calculation of commercial farming sophistication index scores

(Primary farming operation: Stock farmer * 0.300453229780414)

+ (Registered for VAT * 0.304917832846113)

+ (Use a cell-phone as part of farming business * 0.302976592721769)

+ (Use PC as part of farming businesses and farm management * 0.585889113099588)

+ (Use PC for financial management * 0.399969689359916)

+ (Use PC for VAT/tax management * 0.514673779212451)

+ (Use PC for animal/irrigation management * 0.470287613864481)

+ (Use PC for business management *0.277265640843654)

+ (Have Internet access * 0.431459486184270)

+ (Pay wages via Internet * 0.368603037234416)

- 2.1476667354589.

These index scores provide a continuous scale for indicating the levels of commercial farming sophistication. Higher scores are associated with higher levels of sophistication. The next phase in the study concerns the forming and profiling of meaningful segments, in order to present homogenous groups of farming businesses.

5.2.3 Step 3: Segmentation and index validation

The last step in the analysis involved two sub-steps. Firstly, the raw index scores were examined and grouped into a meaningful number of market segments that are homogeneous in terms of farming sophistication. Secondly, the validity of the index was considered by examining the relationship between formed segments across those variables that formed the basis of the sophistication index, as well as amongst other variables that were also expected to be correlated with levels of sophistication. This last step also allowed for the profiling of the segments.

5.2.3.1   Step 3.1: Forming of segments

To form a final set of commercial farming sophistication segments, the scores obtained from the stepwise regression were categorised into a number of approximately equally sized groups, based on the weighted sample. A total of 25 groups were initially formed, which allowed for retaining sufficient group size, while allowing for examining variability in the data. Next, the proportional distribution of variables that formed the basis of the sophistication index was examined across the 25 groups. Where adjacent groups revealed similar proportional characteristics, they were collapsed to form a new reduced set of segment groups. The proportional distribution of groups was again inspected and the same process repeated. This process of evaluating adjacent groups was repeated until a final set of segments emerged. The following criteria were adopted from Jensen *et al.* (2002:92) to guide the process:

- ensuring useful discriminating power across all segments in relation to those variables that were used to construct the index, as well as other variables that are expected to be associated with the index;

- having a compact set of segments to ensure substantiality given the total estimated population of 39 000 commercial farming businesses in South Africa; preferably between four and seven segments;

- having enough segments to permit debates about sophistication thresholds relevant for a particular marketing strategy; and

- have a bottom and top segment that contains the smallest proportions of the population, which serve as the extreme groups along the index scale.

Figure 9 shows the process that was followed for final segment formation.

Figure 9:   Process showing collapsing of 25 groups to form a final set of five market segments
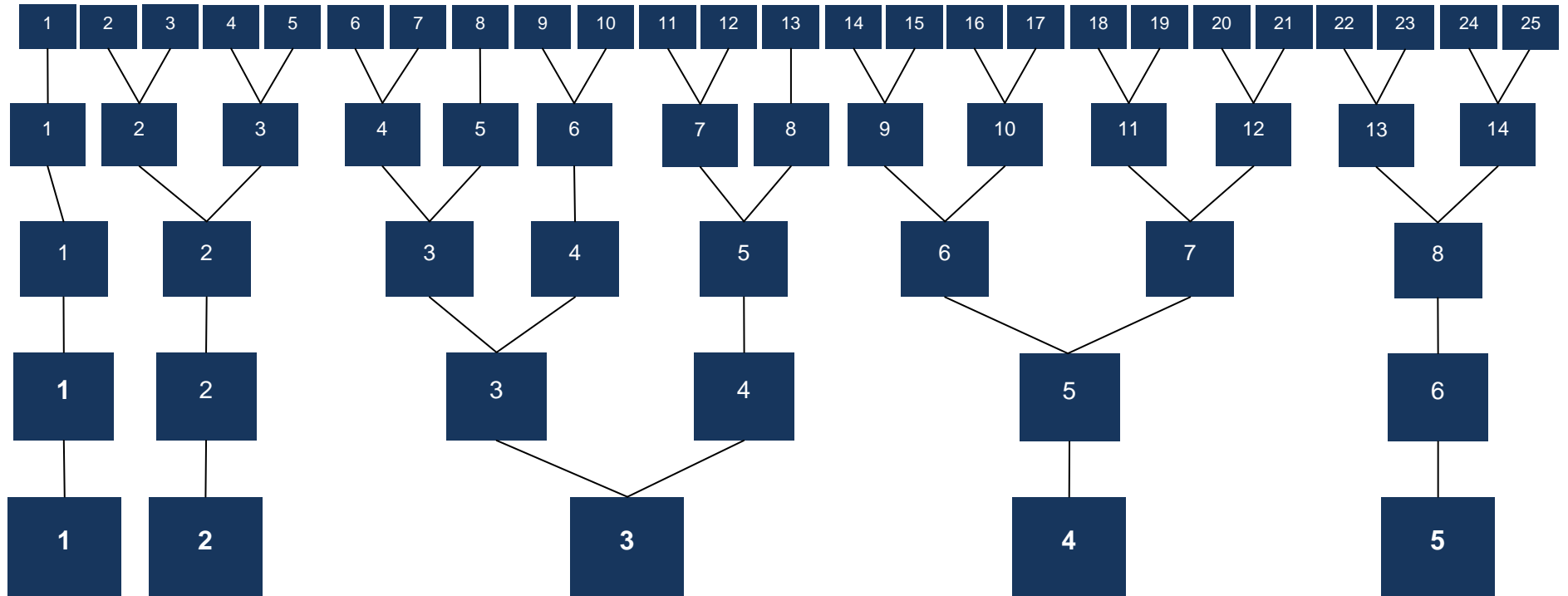
Five segments were eventually formed. Lower and upper cut-off points were identified for the intervals that specify each segment, providing segmentation rules for researchers and practitioners alike. The intervals are:

Segment 1: Lowest through -1.542295672832370
Segment 2: -1.539772309891020 thru -0.483595582926958
Segment 3: -0.483595582926948 thru 0.347833592617228
Segment 4: 0.347833592617238 thru 1.131593949484590
Segment 5: 1.131593949484600 thru highest

Table 22 reports the final estimated segment sizes in the South African commercial farming market (Weighted N = 39 000), based on the categorised levels of sophistication. An approximate 6.5% of commercial farming businesses in South Africa are classified as having the lowest levels of commercial farming sophistication, compared with about 12.2% of the market being classified on the highest level of sophistication. Segments 2, 3 and 4 represent an estimated 81.4% of the commercial farming market in South Africa.

Table 22:   Final estimated segment sizes (Weighted N = 39 000)

	Estimated size (N)	%
Segment 1	2 521	6.5%
Segment 2	9 930	25.5%
Segment 3	10 508	26.9%
Segment 4	11 300	29.0%
Segment 5	4 741	12.2%
Total	**39 000**	**100.0%**

5.2.3.2 Step 3.2: Segment profiling and validation

In the last step, the relationships between segments across those variables that formed the basis of the construction of the sophistication index, as well as amongst other variables that are expected to be correlated with levels of sophistication, were inspected as part of the validation process. It also confirmed meeting the criteria that was set for segment forming.

In Table 23, the estimated percentage of farming businesses in South Africa where a particular characteristic is evident, according to the sophistication segment, are reported. The characteristics reported are those that form the final set of indicator variables used to calculate the raw sophistication index scores from the weighted sample.

Table 23: Distribution of selected index variables across segments (Weighted N = 39 000)

	Segment					
	1	**2**	**3**	**4**	**5**	**Total**
Primary farming operation: Stock farmer	81.8%	69.2%	63.5%	53.8%	70.2%	**64.1%**
Use a cell-phone as part of farming business	25.7%	96.1%	97.1%	94.2%	97.8%	**91.5%**
Use PC as part of farming business/farm management	-	19.3%	99.3%	100.0%	100.0%	**72.8%**
Use PC for business management	-	0.9%	22.4%	48.4%	88.1%	**31.0%**
Use PC for animal/irrigation management	-	0.8%	22.2%	30.5%	87.3%	**25.6%**
Use PC for financial management	-	1.0%	31.4%	79.9%	98.0%	**43.8%**
Use PC for VAT/tax management	-	0.6%	33.0%	67.0%	92.7%	**39.8%**
Have Internet access	-	15.1%	65.7%	94.6%	100.0%	**61.1%**
Pay wages via Internet	-	1.8%	10.5%	53.4%	69.1%	**27.2%**
Registered for VAT	71.8%	97.2%	96.9%	100.0%	100.0%	**96.6%**

An inspection of Table 23 reveals that commercial farming businesses in South Africa forming part of the first segment (an estimated 6.5% of the total market) are characterised as having the lowest levels of commercial farming

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sophistication, and these are predominantly stock farmers (81.8%). An estimated one in four farming businesses (25.7%) makes use of a cell-phone as part of the daily operational and farm management activities. However, the use of a personal computer and having Internet access seem to be largely non-existent. About 71.8% of farming businesses are registered for VAT.

The number of commercial farming businesses forming part of the second segment (an estimated 25.5% of the total market) who are farming primarily with stock are proportionally lower (69.2% compared to 81.8%), with a sizable proportion of farming businesses in this segment (30.8%) being regarded as crop farmers. Where only an estimated one in four farming businesses (25.7%) in the first segment make use of a cell-phone, slightly more than 95% of the farming businesses in the second segment do so. Despite the high proportion of cell-phone users, only one in five farming businesses in this segment (19.3%) use a PC to assist with their operational and farm management activities.

The market penetration of Internet connectivity is also relatively low (15.1%), with only a few farming businesses (1.8%) using this channel to pay wages electronically. As expected, this segment already sees a large percentage of farming businesses (97.2%) registered for VAT.

Of those farming businesses in the third segment (an estimated 26.9% of the total market), an estimated 63.5% farm primarily with livestock, with 36.5% farming with crops. About 97% of farming businesses in this segment make use of a cell-phone. The use of a PC as part of daily farm operational and management activities is evident amongst nearly all of them (99.3%). The use of a PC for various operational and farm management activities emerges within this segment, with 22.4% using one for general farm and business management, 22.2% for animal/irrigation management, 31.4% for financial management, and 33.3% for VAT management.

Nearly 66% have Internet connection, with one in ten (10.5%) paying wages via the Internet. Ninety-seven per cent (96.9%) of farming businesses are registered for VAT.

Of those farming businesses in the fourth segment (an estimated 29.0% of the total market), a much more equal distribution of livestock and crop farming operations is evident (53.8% and 46.2% respectively). About 95% of farming businesses in this segment make use of a cell-phone. The use of a PC as part of daily farm operational and management activities is evident amongst all (100.0%).

The use of a PC for various operational and farm management activities is more established within this segment, with 48.4% using one for general farm and business management, 30.5% for animal/irrigation management, 79.9% for financial management, and 67.0% for VAT management. Nearly 95% have Internet connection, with 53.4% paying wages via the Internet. All the farming businesses within this segment are registered for VAT.

Of those farming businesses in the fifth and last segment (an estimated 12.2% of the total market), a significant proportion of farming businesses are characterised as livestock farmers (70.2%). About 98% of farming businesses in this segment make use of a cell-phone. The use of a PC as part of daily farm operational and management activities is evident amongst all (100.0%). The use of a PC for various operational and farm management activities is established within this segment, with 88.1% using one for general farm and business management, 87.3% for animal/irrigation management, 98.0% for financial management, and 92.7% for VAT management.

All the farming businesses in this segment have Internet connection, with 69.1% paying wages via the Internet. All the farming businesses within this segment are registered for VAT.

Table 24 specifically focuses on the selective firmographic characteristics of commercial farming businesses in South Africa and their relationships with the five segments.

Table 24: Distribution of selective firmographic variables across segments (Weighted N = 39 000)

	Segment					
	1	2	3	4	5	Total
Have secondary branches of farming operations	73.3%	71.6%	75.0%	79.9%	77.5%	**75.7%**
Operate other farming-related business	6.5%	11.6%	24.6%	30.5%	27.2%	**22.2%**
Earn additional income from activities not related to farming operation	54.9%	50.9%	48.3%	53.4%	53.5%	**51.5%**
Primary farming operation administrated: Sole Ownership	90.6%	83.5%	63.7%	54.5%	48.3%	**65.9%**
Primary farming operation administrated: Company	4.3%	1.2%	5.5%	10.5%	19.7%	**7.5%**
Size of farming land: More than 3 000ha	19.2%	20.8%	22.0%	30.7%	28.0%	**24.8%**
Annual turnover: More than R3-million	-	5.2%	9.8%	22.6%	32.7%	**14.5%**
Have cash-flow budget	50.2%	65.1%	71.2%	81.0%	88.7%	**73.3%**
Make use of accountant (external)	34.8%	26.5%	18.8%	33.8%	38.5%	**28.5%**
Make use of independent financial advisor	13.7%	38.6%	43.8%	40.2%	49.6%	**40.2%**
Use: 3G cellular service	-	4.8%	23.9%	30.4%	43.6%	**23.0%**
Have short-term insurance for farming business	74.6%	83.0%	88.6%	90.2%	95.5%	**87.6%**
Operate other farming-related business	6.5%	11.6%	24.6%	30.5%	27.2%	**22.2%**

Inspection of the table reveals that some of the characteristics do not seem to vary notably across the segments. This was confirmed by means of Chi-square tests, using the unweighted database (n = 600) as test data, with the results showing $p > 0.05$:

- Have secondary branches of farming operations;
- Earn additional income from activities not related to farming operations;
- Size of farming land: More than 3 000 ha;
- Make use of accountant (external).

Characteristics that do seem to have a significant relationship with segments ($p < 0.05$) are:

- Operate other farming-related businesses;
- Primary farming operation administered: Sole Ownership;
- Primary farming operation administered: Company;
- Annual turnover: More than R3-million;
- Have cash-flow budget;
- Make use of an independent financial advisor;
- Use: 3G cellular service;
- Have short-term insurance for farming business.

While having secondary branches of farming operations do not seem to differ across the various segments, the prevalence of operating another farming-related business seem to be higher amongst those segments showing higher levels of sophistication. About 6.5% of farming businesses in the first segment also operate another farming-related business, in comparison with 11.6% in segment 2, 24.6% in segment 3, 30.5% in segment 4, and 27.2% in segment 5.

A relationship also exists between the legal structure of a commercial farming operation and segments, with higher levels of sophistication being associated less with sole ownership (48.3% in segment 5 compared with 90.6% in segment 1), but increasingly with that of a company (4.3% in segment 1 compared with 19.7% in segment 5). Segments with higher levels of sophistication also showed higher levels of turnover. No farming businesses in segment 1 reported an annual turnover of more than R3-million, compared with 5.2% in segment 2, 9.8% in segment 3, 22.6% in segment 4, and 32.7% in segment 5.

Commercial farming businesses with higher levels of sophistication are more likely to have a cash-flow budget. About 50.2% of farming businesses in the first

segment reported having a cash-flow budget, compared with 65.1% in segment 2, 71.2% in segment 3, 81.0% in segment 4, and 88.7% in segment 5.

The use of an independent financial advisor is more prevalent amongst segments with higher levels of sophistication. About 13.7% of farming businesses in the first segment reported using an independent financial advisor, compared with 38.6% in segment 2, 43.8% in segment 3, 40.2% in segment 4, and 49.6% in segment 5.

The adoption and use of technologies, such as 3G cellular services are also more prevalent amongst segments with higher levels of sophistication, with about 53.6% of farming businesses in the first segment, compared with 67.5% in segment 2, 76.4% in segment 3, 80.8% in segment 4, and 85.1% in segment 5.

Having short-term insurance is more prevalent amongst segments with higher levels of sophistication. About 74.6% of farming businesses in the first segment have short-term insurance as part of their farming businesses, compared with 83.0% in segment 2, 88.6% in segment 3, 90.2% in segment 4, and 95.5% in segment 5.

The relationship between commercial farming sophistication and the selective demographic characteristics of the active farmer was also explored. Table 25 shows that segments with higher levels of sophistication are more likely to have active farmers with at least a post-matric diploma, a specific agriculture-related qualification and medical cover. Active farmers managing more sophisticated commercial farming businesses are also more likely to regularly review their estate planning.

Table 25: **Distribution of selective demographic characteristics of main activate farmer across segments (Weighted N = 39 000)**

	Segment					
	1	**2**	**3**	**4**	**5**	**Total**
Educational level: Diploma	44.4%	44.9%	57.8%	61.0%	76.5%	**56.9%**
Agricultural related qualification	31.4%	32.2%	51.6%	53.3%	58.2%	**46.6%**
Medical cover	66.6%	86.9%	87.2%	85.7%	88.8%	**85.6%**
Regularly reviews estate planning	85.1%	90.6%	93.1%	96.0%	94.3%	**92.9%**
Educational level: Diploma	44.4%	44.9%	57.8%	61.0%	76.5%	**56.9%**

The last aspect that was considered in the construction of the index and the formulation of segments was the behaviour of data, based on the holdout sample of size n = 276. The holdout sample was independent, as part of the index construction, and this approach allowed for confirming the reliability of the index to serve as a segmentation base. Using the data of the holdout sample, the index values were calculated using Equation 1 (refer to Section 5.2.2.4). The classification rules were applied and five segments were formed.

A comparison of the distribution of selective firmographic characteristics obtained from the holdout sample (n = 276) across the formed segments, as shown in Table 26, and that had been obtained from the sample used to construct the original rules for index calculation (n = 600), shows acceptable levels of correspondence taking into account the sampling errors associated with both samples (approximately 6% and 4% respectively for n = 246 and n = 600).

The average absolute percentage difference between the original estimates reported in Table 24, and those of Table 26, across the 12 variables and five segments, is 6.5%.

Table 26: **Distribution of selective firmographic variables across segments derived from holdout sample (Weighted n = 276)**

	Segment					
	1	2	3	4	5	Total
Have secondary branches of farming operations	72.7%	73.0%	86.6%	76.2%	72.2%	**76.8%**
Operate other farming-related business	18.2%	13.8%	27.1%	21.8%	36.4%	**23.1%**
Earn additional income from activities not related to farming operation	69.9%	36.2%	52.7%	56.3%	47.4%	**51.3%**
Primary farming operation administrated: Sole Ownership	87.7%	62.5%	72.6%	58.1%	59.9%	**65.9%**
Primary farming operation administrated: Company	-	3.7%	-	11.1%	7.6%	**5.2%**
Size of farming land: More than 3 000ha	14.8%	29.0%	18.8%	26.2%	32.4%	**24.8%**
Annual turnover: More than R3-million	-	4.1%	12.0%	13.2%	39.4%	**13.5%**
Have cash-flow budget	53.3%	71.0%	64.2%	84.9%	91.7%	**74.7%**
Make use of accountant (external)	14.3%	22.6%	21.3%	23.6%	30.3%	**22.8%**
Make use of independent financial advisor	37.2%	35.3%	32.6%	43.5%	52.3%	**39.9%**
Use: 3G cellular service	6.2%	9.2%	18.8%	23.2%	41.2%	**20.5%**
Have short-term insurance for farming business	71.6%	72.5%	83.8%	89.7%	87.5%	**82.2%**

Similarly, the distribution of selective demographic characteristics obtained from the holdout sample (weighted n = 276) across the formed segments, as shown in Table 27, and that were obtained from the sample used to construct the original rules for index calculation (n = 600), shows acceptable levels of correspondence.

The average absolute percentage difference between the original estimates reported in Table 25, and those of Table 27, across the four variables and five segments, is 5.5%.

Table 27: **Distribution of selective demographic characteristics of main activate farmer across segments derived from holdout sample (Weighted n = 276)**

	Segment					
	1	**2**	**3**	**4**	**5**	**Total**
Educational level: Diploma	40.3%	59.0%	68.4%	60.0%	80.9%	**62.7%**
Agricultural related qualification	31.8%	44.7%	61.3%	48.9%	69.0%	**52.1%**
Medical cover	75.0%	79.5%	81.3%	90.5%	87.1%	**83.7%**
Regularly reviews estate planning	83.3%	87.9%	97.7%	96.1%	94.0%	**92.9%**

5.3 CHAPTER SUMMARY

This chapter presented the results pertaining to the constructing of a commercial farming sophistication index for South Africa. This served as basis for investigating and illustrating the process of index construction as a method of market segmentation. Details of the analysis performed in each step of the process was reported and interpreted. A final segmentation of the market was presented.

In the next chapter, conclusions pertaining to the original research objectives are made, areas for future research identified and limitations of the study.

CHAPTER 6: CONCLUSIONS, IMPLICATIONS & IMPERATIVES FOR FUTURE RESEARCH

6.1   INTRODUCTION

In Chapters 1 to 5 the main body of this thesis was presented. In Chapter 1 the purposed statement was formulated as well as the specific research objectives. A motivation was presented for the importance and benefits of the study. The chapter also noted in brief the research resources and methodology, and study delimitations and assumptions.

Chapters 2 and 3 drew from the literature to provide a discussion and critical reflection on the foundations and processes of market segmentation and index construction, and how index construction can be applied as a method of market segmentation. Three studies in particular provided pragmatic reference in this regard, namely that of African Response (2006), the South African Advertising Research Foundation (2009), and Jensen *et al.* (2002)

Chapter 4 depicted the research design and methods employed in this study. The availability of secondary data provided an incidental, but relevant and recent quantitative base to investigate and illustrate this process in a business context. The data were used to construct a commercial farming business index and applied it as a method of segmentation. The analysis and results pertaining to this process were presented in Chapter 5.

In this chapter, the conclusion is drawn, on the basis of the research findings, that the process of index construction provides an appropriate and useful means of segmenting a market. As part of the research findings to illustrate such a process, a commercial farming sophistication index was constructed and applied as a method of segmentation.

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The implications that this process hold for researchers and marketing practitioners are discussed.

It is pointed out that the illustration of the process has wider application value in other business-to-business markets, locally and internationally, where index variables can be constructed from both primary and secondary sources and used as a method of segmentation.

The chapter also includes imperatives for future research.

6.2   CONCLUSION

It was noted in this study that market segmentation is regarded essential by marketing practitioners for various reasons, including targeting, proposition development, price formulation and developing of mass communication (Bailey *et al.* 2009:227). Though being conceptualised as simple in its rationale, the process of segmentation is not necessarily easy (McDonald & Dunbar, 2004:xv) and it requires various considerations that should be taken into account. From the literature it is evident that many marketers are expressing concern about implementation and the integration of segmentation into marketing strategy (Dibb & Simkin, 2009:219). To address this, priorities in the area of future segmentation research include the selection and incorporation of new variables into segmentation models, as well as developing new and innovative segmentation strategies (Dibb & Simkin, 2009:222).

A specific area of segmentation development that has been neglected in the academic literature but holds particular pragmatic relevance for marketing practitioners is the process of index construction as a method of market segmentation. The vast array of possible variables available for segmentation purposes often complicates the process, particularly in cases when these variables measure a single underlying construct.

The research objectives of this study called for investigating the process of index construction as a method of market segmentation. The process was illustrated by means of constructing a commercial farming sophistication index for South Africa and using it to form segments. These two objectives were to form the basis of assessing the use of index construction as a market segmentation method.

In the sections that follow, each objective is evaluated against the outcomes of the research findings.

6.2.1 Investigating the process of index construction as a method of market segmentation

Investigating the process involved a review of the literature on the principles of market segmentation, index construction, and lastly where index construction has been applied as a method of index construction. The conclusions drawn from the literature pertaining to each of the areas are discussed in the sections that follow.

6.2.1.1 Market segmentation

A number of key conclusions about the principles of market segmentation are drawn from the literature.

Market segmentation forms part of the strategic marketing process (Freathy & O'Connell, 2000:102); and is linked to improved business performance and achieving of a competitive advantage.

It provides a process of combining groups of buyers into larger buying units, which makes the marketing activities of companies both cost-effective and manageable (McDonald & Dunbar, 2004:xv).

Segmentation is a mediating process used by researchers, marketing practitioners and management to improve understanding of the market (Dibb, 1998:394); assist in designing more suitable marketing strategies and programmes (Canever *et al.*, 2007:513; Dibb *et al.*, 2002:113; Quinn *et al.*, 2007:440); help focus on those buyers that have the greatest chance of being satisfied; identify new marketing opportunities (Dibb, 2005:14; Quinn *et al.*, 2007:440); and inform more effective allocation of financial and other resources (McDonald & Dunbar, 2004:55; Quinn *et al.*, 2007:440).

Despite being described as simple in its rationale, it is generally acknowledged that the process of segmentation is not necessarily easy (McDonald & Dunbar, 2004:xv).

The process of market segmentation is described as conceptual, analytical and consisting of inter-linking steps and processes (Canever *et al.* 2007:511; Cant *et al.* 2006:104; Noel, 2009:113; Quinn *et al.* 2007:445). These typically include in one or other form segmentation analysis, evaluation of segmentation, implementation of segmentation, and lastly, the control of segmentation. Segmentation analysis consists of all the activities involved in dividing a heterogeneous market into homogeneous sub-markets. The selection of segmentation bases, research methodologies, as well as data analysis plans constitutes important pillars of the segmentation analysis.

Planning and implementing a segmentation study involves various considerations. These are:

- *Defining the aim of performing market segmentation:* Addressing the specific information needs of management must guide the gathering of relevant data needed for the segmentation exercise.

- *Market definition:* One of the more crucial decisions that marketers face (Foedermayr & Diamantopoulus, 2008:248) and involve demarcation of the market.

- *The selection of segmentation variables (base and descriptors):* This is often complicated by the vast array of possible variables available for segmentation purposes (Tonks, 2009:341).

- *The selection of segmentation approach:* A-priori scheme and cluster-based segmentation approaches are two major strategies used in practice. A successful segmentation exercise lies with recognising when segment groups are a true reflection of the market and not merely imposed on the data by the method.

- *Determining the research design:* Research design should be informed by the management requirements of the segmentation, the market definition, and the selection of segmentation variables, as well as the adoption of a particular approach. However, evidence from the literature suggests that there is a general lack of validity and reliability assessments in empirical research on segmentation practices.

- *Identifying the units of analysis:* This should take into account accessibility and availability of information. It is also important that the units of analysis be chosen in accordance with the operational capabilities of a business's marketing, sales, and market research units.

- *Sampling:* The aim should be to not merely explain the differences amongst specific respondents or to segment the sample, but to project the results of the study to the relevant universe.

- *Selecting the data-collection method:* Both primary and secondary data could be used for segmentation. Secondary data need to be evaluated in terms of quality, content, usability, presentation and cost (Wiid & Diggines, 2009:77).

- *Segment identification:* Guidelines for formation propose that segments must consist of an economical minimum number of buyers, and the number of segments formed must be such that it is manageable (Foedermayr & Diamantopoulus, 2008:253). Each segment should be subjected to a "reality check" based on the size of each segment, the differentiation between the offers they require, the business's ability to

identify and reach the different buyers found in each segment, and the compatibility of these segments with the business (McDonald & Dunbar, 2004:57). Statistical tools can aid in segment formation, in particular the use of multivariate techniques. The segmentation team should be aware of the pitfalls associated with its inappropriate use in guiding the identification of segments. Replication of identifying segments remains a challenge when using multivariate statistical techniques. A study might utilise a single base variable to segment the market, or several variables can be combined. The use of index variables as a method of segmentation offers various advantages.

- *The selection of the target segment:* Following the identification of segments, the relative attraction of each segment must be determined (Dibb, 2005:13), together with the subsequent selection of segment(s) to target. This should be done with consideration of the available resources, skills and capabilities of the business (Freathy & O'Connell, 2000:103). The evaluation of the strengths and weaknesses is a crucial step in the process.

- *Positioning:* This step involves implementation. It is within the context of this step that concerns have been raised in the literature of a theory/practice divide in market segmentation. Two main arguments and reasons for this divide emerge from the literature. The first argument relates to the practical difficulties in implementing segmentation approaches; and secondly, the often limited explanatory value offered from traditional segmentation bases.

A segmentation solution can be evaluated against certain criteria in order to be regarded as successful (Canever *et al.*, 2007:514; Ferrell & Hartline, 2005:142; Freathy & O'Connell, 2000:102; Goller *et al.*, 2002:261; Lin, 2002:250). These criteria are: segmentability, measurability, accessibility, substantiality, sustainability, actionability, responsiveness and stability.

6.2.1.2 Index construction

A number of key conclusions about index construction are drawn from the literature.

An index is derived from multiple items and when combined forms the basis of underlying construct that is quantitative and on a measurement continuum.

Three steps in index construction can commonly distinguished, namely: (1) Item/variable selection; (2) examining the empirical relationships of variables and combining of these items into an index; and (3) validating the index.

An important criterion to consider during the first step is the face validity of items. The selection of items should be guided by a clear and precise definition of the construct itself (Spector, 1992:7).

During the second step, the relationships among items are considered, with the anticipation of combining items into a single and one-dimensional construct variable.

The last step involves examining index values across the item responses which comprise it, as well as other items that might explain variation.

As with market segmentation, constructing an index involves various considerations. These are:

- The aims envisaged for the construction of a specific index.

- Assumptions underlying the index construction process.

- Steps, processes and multivariate statistical methods that could be employed for the calculation of index scores. While being statistically

demanding, applying multivariate statistical techniques, such as principal component analysis and factor analysis, to derive index scores, offer a number of benefits over those methods that rely merely on a summation of items. Firstly, these techniques account for the underlying correlation that exists amongst items. The index variable therefore takes advantage of the strength of the underlying relationships that exist between items. Secondly, items that correlate strongest or load highest with a dimension or factor are grouped together, increasing the internal reliability of the index variable. In addition, the inter-correlation between items within a factor is typically high, which relates to convergent validity. In other words, measures that should be related are in reality related. However, correlation between factors or dimensions is typically not significant, which relates to discriminant validity. In other words, measures that should not be related are in reality not related. Convergent and discriminant validity are both considered subcategories of construct validity. Thirdly, when applying multiple regression analysis to identify those items that best predict index scores derived from the factor analysis, coefficients are calculated that provide a weighted contribution of each item to the index scoring.

The following aims are typically associated with index construction, namely:

- To construct an index that is a measure of a specific construct.

- To construct an index using a combination of variables that could measure the construct better than any single variable.

- To construct an index that is a direct measure of the construct, based on non-monetary descriptive indicators.

- To identify Items that, on face value, relate to the construct being measured.

- To construct an index that is reliable and valid.

- To construct an index that has broad application value across the full spectrum of the market.

- To present a measurement process that is useful in future surveys from which separate samples are drawn.

- To construct an index that is stable over time, but sensitive enough to register changes.

6.2.1.3   *Moving from index construction to market segmentation*

An important step in the process of moving from index construction to applying it as a method of index construction involves deriving of a general use form of the index that could be easily calculated by other researchers and survey practitioners. Multiple regression analysis provides a means of identifying those items that best predict the index scores. The results of the analysis also provide a set of coefficients in the form of an equation. This equation can then be used by other researchers in future studies.

A set of cut-points is derived on the index scores. The process of establishing cut-points for the intervals is informed by basic descriptive statistics, as well as adhering to criteria specified by the researchers. The forming of groups is therefore not based on an advanced statistical clustering method of index scores.

6.2.2 Constructing a commercial farming sophistication index as a method of segmenting the market

To illustrate the process of index construction as a method of market segmentation, secondary data were used to construct a commercial farming sophistication index.

The processes and methods identified during the literature review provided a framework for constructing of the index and market segmentation.

It is concluded that the success of the process was based on the following:

- Establishing of clear set of aims for constructing a sophistication index. For example, the aims were to construct a measure that is one-dimensional, can discriminate across the full spectrum of commercial farming businesses in South Africa, and is both valid and reliable.

- Establishing of a clear conceptual definition of the construct being measured. This informed and guided the researcher in identifying questions and items that, on face value, could contribute towards measuring of the construct.

- Gaining an understanding of the market being segmented in terms of units of analysis. The construct measured sophistication of commercial farming businesses, and not the farmer. In business segmentation studies it is crucial to distinguish between units of analysis and units of observation.

- Identifying of relevant, valid and sufficient data. It was found essential to evaluate the relevance and quality of the secondary data against both practical and methodological criteria. For example, the fit between the original data and the new research questions. It was furthermore beneficial to have been able to use the data and project it to population estimates. This will allow marketing practitioners to more accurately evaluate target segments with regard to buying power and profitability.

- Ensuring the standardisation of data for multivariate analysis purposes. For example, the use of principal component analysis requires that all variables be measured on the same scale. In this study, all variables were coded in binary form.

The newly created sophistication index offers significant advantages over traditional firmographic segmentation variables, as levels of sophistication are regarded as significant explanatory variables for the adoption of information and communications technology (ICT) product and service usage, such as a PC, a cell-phone, and the Internet as part of the farming business. As highlighted, the findings of this study also revealed that farming businesses along the

sophistication continuum tend to adopt the use of a PC, firstly, for financial management purposes, rather than using a PC in other functional management areas.

A second benefit that the segmenting of the commercial farming market in terms of sophistication offers to marketing practitioners is an improved understanding of buyers. This includes the building of a profile of each segment, improving insight into possibly required products and service offerings. It was, for example, found that more sophisticated farming businesses are more likely to be using certain financial products, such as short-term insurance, or being registered for VAT. Other characteristics that have a positive relationship with higher levels of sophistication include operating other farming-related businesses; being registered as a company; having a cash-flow budget; and making use of an independent financial advisor.

Segmentation would, therefore, allow marketers to tailor products and services to better suit market needs – leading to more suitable marketing programmes and enhanced marketing effectiveness.

Having homogenised the market and increased in understanding of the buyers, a third benefit offered by the segmentation method is that of identifying new opportunities. This is in line with Dibb *et al.* (2002:113), who postulated that market segmentation improves marketing practitioners' ability to identify marketing opportunities. In addition, future studies conducted by suppliers could be used to estimate the market share in each segment – leading to the acquisition of valuable insight in competitor behaviour and market position, which could be used in building and sustaining a differential advantage.

A fourth benefit emerging from this method is the guiding role it plays in strategic marketing planning and resource allocation. The principle of market segmentation is, therefore, one that because of limited resources and skills, companies cannot service all buyers in a diverse market. The method of

segmenting the commercial farming market on levels of sophistication could aid companies to match their limited resources and strategies to buyers' needs and wants.

By focusing their limited resources on the most attractive segments, segmentation encourages businesses to play to their strengths. All these benefits culminate in achieving greater overall market stability, improved performance and a competitive advantage.

In addition, the success of the process of applying index construction as a method of segmentation might also be assessed against the criteria identified in the literature (Canever *et al.*, 2007:514; Ferrell & Hartline, 2005:142; Freathy & O'Connell, 2000:102; Goller *et al.*, 2002:261; Lin, 2002:250). Four of these criteria apply in particular to this study, namely: segmentability, measurability, accessibility and substantiality. The other criteria, namely sustainability, actionability, responsiveness and stability are relevant to specific users of the segmentation model.

Segmentability: Successful segmentation can only take place if buyers can be grouped together, based on particular criteria, in other words contribute towards homogeneity within and heterogeneity between groups. The index constructed in this study groups farming businesses in South Africa, based on similar levels of commercial farming sophistication, discriminating across the full continuum of commercial farming businesses. Furthermore, the findings presented clear characteristics that define the various segments.

Measurability: This refers to the degree that the size, purchasing power and profits of a market segment could be identified (Canever *et al.*, 2007:514; Freathy & O'Connell, 2000:103). While the construction process called for an index that should be based on non-monetary descriptive indicators, positive correlation was identified between higher levels of sophistication and turnover.

*Accessibility***:** Segments should be accessible in terms of communication and distributional efforts (Canever *et al.*, 2007:514; Ferrell & Hartline, 2005:142). The findings showed that levels of sophistication were positively associated with increasing incidents of ICT product and service usage, such as a PC, cell-phone, and the Internet as part of the farming business. The adoption of these mediums provides opportunities for cost-effective marketing communication.

Substantiality: This refers to the degree to which a segment is considered sufficiently large enough to warrant the cost of a targeted market program (Canever *et al.*, 2007:514; Freathy & O'Connell, 2000:103). The index allowed for the identification of five homogenous segments that were considered sufficiently large, given the market size of approximately 39 000 commercial farming businesses in South Africa.

Having segmented the commercial farming market, practitioners also have a better understanding of the pragmatic world. The results and findings could assist them in formulating marketing strategies and making predictions, as well as in the interpretation of the present when attempting to understand what is happening and why (Christensen & Raynor, 2003:68).

6.2.3 Assessing the use of index construction as a method of market segmenting

Following the investigation and illustration of the process of index construction as a method of market segmentation, the conclusion is drawn that this approach offers an appropriate and useful means of segmenting a market. Several factors contribute to the appeal of this approach.

From an academic perspective, it contributes towards addressing important priorities in the area of future segmentation research, namely that of investigating the application of new variables into segmentation models, as well as investigating new segmentation strategies. Incorporating innovative

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segmentation approaches, processes and methods that can improve one's understanding of the market is valued by marketing practitioners. This contributes towards realising the advantages of market segmentation, which are promoted extensively in the literature (Dibb, Stern & Wensley, 2002:113; Ferrell & Hartline, 2005:134; Freathy & O'Connel, 2000:102; Goller *et al.*, 2002:263; McDonald & Dunbar, 2004:34). These include homogenising market heterogeneity, improving an understanding of buyers, the identification of new market opportunities, better allocation of business resources and skills, and improved performance and competitive advantage.

From a practical perspective, the approach applies a creative process of combining several base variables into a single measure, namely that of an index variable. This allows for reducing complexity in the often unstructured data that researcher and marketing practitioners have to deal with. This is beneficial as it offers a more simplified description of market behaviour across segment groups, in particular when researchers are faced with a multitude of single base variables that in essence measures a single underlying construct. By doing this, it contributes towards marketing practitioners improving their understanding of market segments, which would not have been possible through the use of single segmentation base variables.

It also contributes towards offering a segmentation variable that provides more discriminating power in explaining market behaviour, than the often very limited explanatory value offered by traditional external variables.

The process contributes towards homogenising the market heterogeneity in terms of a single construct. The segmenting of the market could also facilitate a more homogeneous response to marketing programmes. While segmentation might not be a direct contributor to improved performance and competitive advantage, the essence of market segmentation lies in the notion that it has a moderating effect on performance (Dibb *et al.*, 2002:114; Quinn *et al.*, 2007:444).

The multi-step process that was employed in this study for the construction of the index and subsequent market segmentation has broad pragmatic appeal for researcher, and provides a systematic and structured multivariate approach to segmentation. It also facilitates replication of the process when conducting future studies.

By using an index, it takes advantage of any intensity structure that may exist among attributes. This has the advantage that it places members of the market on a continuum that can lead to tracking members' development paths as they progress towards higher levels, for example farming sophistication. From a segmentation perspective, lower and upper segments can be distinguished based on differences in aspects such as buyer behaviour, product adoption, communication channels, decision-making processes, price sensitivity access, and the like.

Furthermore, illustration of the process has wider application value in other business-to-business markets, locally and internationally, where index variables can be constructed from both primary and secondary sources and used as a method of segmentation following a similar multi-step approach proposed in this study.

The outcome of this type of segmentation method offers researchers and marketing practitioners a procedure, in the form of an equation, to calculate index scores and provide rules to segment the market based on predefined intervals. This provides for consistency in the rules and criteria used to calculate index values and apply it as a method of market segmentation. Hence, the challenge to replicate segment formation across independent future studies is addressed. This process is considered an advantage over employing a technique such as cluster analysis, where the use of new data or changes to the clustering algorithm often leads to different segment solutions. By offering classification rules based on characteristics that can easily observe or elicit by

asking a few key questions, new or potential buyers can be classified by buying behaviour segment.

6.3 IMPLICATIONS

This study promotes the use of index construction as a means of market segmentation. Combining several base variables into a single index measure contributes towards marketing practitioners improving their understanding of market segments, which would not have been possible through the use of single segmentation base variables.

The process proposed serves as guideline for planning and implementing such a segmentation approach. Firstly, it allows researchers and marketing practitioners to place new or potential buyers on the index continuum using an existing equation. Secondly, this is made possible based on characteristics that can easily observe or elicit by asking a few key questions. A new segmentation base is therefore offered that provide more discriminating power than the single variables would have.

Lastly, despite commercial farming businesses being an incidental market focussed upon in this study to illustrate the process under consideration, the construction of a commercial farming sophistication index and presenting of rules for segment formation holds significant immediate and practical value for marketing practitioners and input suppliers that plan to conduct market segmentation studies in future where commercial farming businesses are targeted.

6.4   LIMITATIONS

This thesis is the result of an investigation into the process of index construction as a method of market segmentation. Specific limitations were formulated in the literature review and during the empirical part of this study, which focussed on illustrating the process by constructing a commercial farming sophistication index as a method of segmentation.

Based on the literature review the following limitations have been formulated:

- There is limited academic literature on the application of index construction as a method of market segmentation. It is possible that some important empirical research has been conducted on this process, but the findings reside either in repositories outside the academic sector or has not been documented formally in academic literature. As a result this has been excluded.

- Limited published statistics are available to the public on the size and profile of the commercial farming business market. Assessing the external validity of the weighted sample was therefore not possible.

The following limitations can be cited following the completion of the research and reporting of results:

- The illustration of the process was limited to the commercial farming business market.

- Due to the fact that secondary data was used as incidental source for index construction and segmentation, the researcher was restricted to a limited set of pre-developed questions (variables) that could be used as potential measure of commercial farming sophistication and profiling of segments.

- The combination of variables to derive index scores was limited to the use of one specific multivariate statistical technique, namely principal component analysis.

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6.5 IMPERATIVES FOR FUTURE RESEARCH

The following imperatives for future research are put forward based on the general multi-step process proposed for index construction and market segmentation:

- To continue with empirical research where the process of index construction as a method of segmentation can be investigated across different markets and contexts.

- That research is conducted to compare the use of different multivariate techniques as part of index score calculation.

- That some investigation is conducted on multivariate statistical techniques that can guide segment forming when using a single continuous variable. This would also entail a comparison of the effectiveness of this approach to one where segment forming takes place subjectively.

- To investigate the impediments of moving from segmentation planning to segmentation implementation. This remains an important agenda for future segmentation research.

With regard to the specific construction of the commercial farming sophistication index the following recommendations for future research are made:

- That primary research be conducted in order to expand the potential list of questions and variables that can contribute towards constructing a commercial farming index, as well be used to profile the segments.

- To conduct further analysis in order to explore the relevance of expanding the current number of segments and the value that this expansion holds for marketing practitioners.

- That research is conducted to establish validity of the construct of commercial farming sophistication.

- That an index of farming sophistication be constructed in the context of emerging and subsistence farming markets. This will require redefining the construct of sophistication for these market, and identification of different sets of variables that could measure the constructs. Understanding the behaviour of these markets on the basis of sophistication and how they progress towards higher levels is of value for an entity such as government given the agenda of business development.

- The findings from this study revealed that levels of sophistication are positively associated with increasing incidents of ICT product and service usage, such as a PC, a cell-phone, and the Internet, as part of the farming business. However, the focus only fell on incidents of ICT usage, and not on aspects relating to early product or service adoption. Future research studies could explore and confirm this relationship.

- Given the rapid change and introduction of new products, services and technologies to the market, as well as the evolving farming production practices, a periodic review of the items used to measure sophistication should be conducted. This might also result in either the merging or the splitting of segments.

6.6   CHAPTER SUMMARY

In this chapter, consideration was given to the conclusions of the study with regard to the investigation of the process of index construction as a method of index construction, followed by conclusions pertaining to a practical illustration of the process. Conclusions were then drawn based on the assessment of the process. Thereafter, limitations of the study were pointed out. Next the implications were noted and lastly imperatives for future research stated.

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