Servitization Capabilities of Selected South African Manufacturers

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ABSTRACT

This paper examined the correlation between the servitization capabilities observed in South African companies and the servitization capabilities presented in the literature. The study also assessed whether differences exist in the extent that servitization capabilities are implemented at South African companies when compared to the extent of their implementation at European and North American (ENA) companies. Unlike with most of the existing servitization literature, this study did not make use of case studies and interviews as a research method, instead annual reports were sampled. Content analysis using a coding scheme was performed and both statistical and textual results were produced. The results suggest a correlation between the servitization capability literature and the servitization capabilities observed in practice. The extent of this correlation, however, differed between companies and between the South African sample and the ENA sample. South African companies were found to be closely associated with the data gathering and exchange, digitalisation, network management and "other" capabilities whilst the ENA companies were closely associated with the service development and delivery, service-oriented culture, customisation and "other" capabilities. Further research is required to determine the reasons for these differences and assess whether they impact servitization outcomes.

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DEFINITIONS

Capability – "The collective skills, abilities, and expertise of an organization and represent the ways that people and resources are brought together to accomplish work" (Ulrich and Smallwood, 2004).

Correlation – "A mutual relationship or connection between two or more things" (Oxford English Dictionary, n.d.)

Customisation – "The action of altering a product or service to suit a person's or company's preferences or requirements" (Market Business News, n.d.).

Digitalisation – "To enable or improve processes by leveraging digital technologies and digitised" data (Gupta, 2020).

Manufacture – "The processing of raw materials or parts into finished goods through the use of tools, human labour, machinery, and chemical processing" (Kenton, 2022).

Network – "A complex network of companies, working together to accomplish certain objectives" (Ford et al., 2011).

Service – "Any activity or benefit that one party can offer to another, which is essentially intangible and does not result in the ownership of anything" (Kotler et al., 2008).

Servitization – "A business' transition from the selling of products to the selling of a combination of products, services and business solutions" (Vandermerwe and Rada, 1988).

Solution – "All software, products and services from which a Company Party is currently deriving, or currently contemplating to derive, revenue, including from the sale, distribution, license, maintenance, subscription, support or provision thereof" (Law Insider, n.d.).

Stock exchange – "Where different financial instruments are traded, including equities, commodities, and bonds" (Harper, 2022).

ABBREVIATIONS

AVA – Applied Vehicle Analysis
ENA – European and North American
FTSE – Financial Times Stock Exchange Group
HR – Human Resources
ICB – Industry Classification Benchmark
ICT – Information and Communications Technology
IIRC – International Integrated Reporting Council
IoT – Internet of Things
JSE – Johannesburg Stock Exchange
PDF – Portable Document Format
RD – Research and Development
SADC – South African Development Community
VBP – Value Based Pricing
VBS – Value Based Selling

1 INTRODUCTION AND BACKGROUND

1.1 Background

Servitization in manufacturing can be described as a business' transition from the sale of products to the sale of a combination of products, services and business solutions (Vandermerwe and Rada, 1988). Globally a third of manufacturing companies offer services whilst two-thirds of manufacturers in developed nations have servitized (Bowen et al., 1989; Cusumano et al., 2015; Neely, 2008; Visnjic et al., 2014). It is worth noting that the servitization market is expected to grow from 4.5 billion Euros in 2016 to 33 billion Euros by 2025 (Khanra et al., 2021).

The increase in the number of manufacturers who are considering adding services to their offerings can be attributed to the promise of a consistent revenue stream that services represent (Kohtamäki et al., 2020). In addition, increased competition and lower profit margins have prompted some manufacturers to introduce service offerings as a way to diversify their income stream (Turunen, 2012). Studies have also shown service offerings to have a higher profit margin whilst also presenting an avenue for the manufacturer to sell more of their products (Gebauer, 2008; Gebauer et al., 2006; Oliva and Kallenberg, 2003). These benefits coupled with the potential for improved customer satisfaction and strengthened customer relations make servitization an attractive option for manufacturers (Brax, 2005; Brax and Jonsson, 2009; Gebauer, 2008; Mathieu, 2001; Penttinen and Palmer, 2007).

Despite the potential benefits of servitization, some companies struggle to realise the financial benefits of servitization (Benedettini et al., 2015; Eric (Er) Fang et al., 2008). Also worth noting is the suggestion by Benedettini and Neely (2018) that, to some extent, the transition to servitization for manufacturing companies may be unrelated or even negatively related to revenue growth. Furthermore, Neely (2008) stated that while servitized firms may generate higher revenue, they are likely to realise a smaller net profit as a result of higher labour costs and the inability to generate high enough margins to cover the initial investment. Neely (2008) also suggests that the manufacturer's size is the moderating factor that influences its profit margins, with smaller servitized manufacturers reporting greater profit margins when compared to larger servitized manufacturers. Additionally, Benedettini et al. (2015) found that the type of services offered had an influence on whether or not a manufacturer's servitization efforts would lead to desired financial returns. Benedettini et al. (2015) also discovered that manufacturers offering demand chain services (which include retail and distribution or financial services) were at greater risk of bankruptcy than those who offered product support services (i.e., installation and implementation, systems and solutions, maintenance and support). This difference in outcomes is said to be because demand chain services are associated with greater environmental risks (Benedettini et al., 2015).

Manufacturer size and the type of services offered are not the only internal factors found to influence servitization outcomes. Capabilities have been found by some researchers to play a significant role in a manufacturer's servitization outcomes (Baines and Shi, 2015; Coreynen et al., 2017; Kowalkowski and Ulaga, 2017). Capability can be defined as a company's ability to perform current activities efficiently or productively (Jacobides and Winter, 2012; Teece, 2012). However, this definition does not address effectiveness which would be measured in varying ways depending on the capability being considered. A more

detailed description of capabilities is provided by Ulrich and Smallwood (2004) who define capabilities as "the collective skills, abilities, and expertise of an organization" and represent "the ways that people and resources are brought together to accomplish work". Although research into servitization capabilities exists, it is largely exploratory in nature and employs case study, survey and interview research methods (Hallstedt et al., 2020; Kindström et al., 2013; Raddats et al., 2017, 2015; Sholihah et al., 2020; Ulaga and Reinartz, 2011). Even though these methods are suitable and valid, they require that the researcher interacts with respondents. During surveys and interviews, respondents are aware that the study is being conducted and this has the potential to introduce errors in the data the researcher collects (Davis, 1966). Results from in-depth interviews also cannot be generalised (Almeida et al., 2017). Furthermore, case study research, which according to the researcher's observations is the most commonly used method for servitization capability research, has its own flaws. Case study research has not only been criticised for lacking scientific rigour, but also for not being able to produce results that can be generalised (Yin, 2009). Other scholars such as Woodside and Wilson (2003) are of the view that a single respondent is unable to provide the detailed insights required to understand whatever process is being studied. This then necessitates that multiple respondents be consulted and triangulation of methods be adopted (Woodside and Wilson, 2003). Considering the limitations of the aforementioned research methods, it may be useful to check for a correlation with the existing literature through the use of an unobtrusive research method such as content analysis.

The shortage of servitization capability research using alternative methods is not the only gap that exists in the literature. Servitization capability research is often based on findings from companies that operate primarily in Europe and North America (ENA). In addition, although research has been done on how different company variables influence servitization outcomes, not much research exists (if any) that observes how the presence, absence or extent of certain servitization capabilities differs across regions. Some literature does however exist on servitization within the South African context (Benade and Weeks, 2010; Weeks, 2011; Weeks and Benade, 2015, 2009). Although this research does not focus specifically on servitization capabilities, it does provide some insights into servitization strategies implemented in South Africa. Weeks and Benade (2009) suggest that their findings indicate a correlation between servitization theory and the servitization strategies implemented in practice. However, the authors do acknowledge that the research they've conducted so far has been limited in scope and that further research is required to support their findings (Weeks, 2011; Weeks and Benade, 2009).

This paper hopes to add to the literature by expanding on the research conducted by Weeks (2011) and confirming a correlation between the servitization literature and servitization capabilities as they exist in practice. Furthermore, the researchers hope to identify any differences in servitization capabilities between South African-based companies and ENA companies.

1.2 Problem Statement

Many manufacturing companies who embark on servitization, often fail to reap the desired financial returns from their service activities. Much of the research on servitization capabilities is conducted in ENA countries, using the case study, interview and survey research methods. Research remains limited that proves a correlation between established servitization theory and the practical implementation of servitization capabilities at South

African companies. Should this gap remain, South African companies may struggle to decipher which of the servitization capabilities presented in the literature are applicable to them in practice, potentially leading to the failure of their servitization efforts.

1.3 Research Question

To what extent do servitization capabilities established in South African manufacturing companies correlate with the servitization capability literature?

1.4 Research Objectives

The objectives of this research are to:

a. Use the existing literature to establish a servitization capability framework.
b. Identify servitization capabilities in the annual reports of selected servitized South African manufacturing companies.
c. Identify servitization capabilities in the annual reports of selected servitized ENA manufacturing companies.
d. Determine whether there are differences between the servitization capabilities established at South African manufacturing companies versus those established at ENA manufacturing companies.

1.5 Summary of the Research Method

Only companies listed on a stock exchange were sampled for this study. This was to ensure that the sample size did not become too large. Additionally, this decision also facilitated the exclusion of companies whose revenue would be considered too small to be listed on a stock exchange. This was due to the fact that the size of a company's operations has previously been found to be a contributing factor to its servitization outcomes (Neely, 2008). Controlling for company size (in terms of revenue) eliminated the variability that differing company sizes could introduce to the data. A sample of ten annual reports of South African manufacturing companies and ten annual reports of ENA manufacturing companies was collected.

Content analysis was used as the research method for this study. The context unit was the annual report. The latest annual report was analysed for each participating company. The recording unit was chosen to be the sentence and a coding scheme was developed and applied to the sampled annual reports. Once the sentences in the annual reports were coded, the results were analysed and inferences were made to develop conclusions.

1.6 Delimitations

While there are many aspects to servitization this study only focused on servitization capabilities. The researcher was concerned with determining the extent to which servitization capabilities identified in the literature were implemented by selected servitized South African manufacturing companies. Furthermore, the researcher was interested to see if there were any differences between the servitization capabilities South African companies reported compared to the ones the ENA companies reported. The impact that servitization capabilities had on company performance variables was not explored. Similarly, variables such as the number of employees, the industry of operation,

or the type of products sold were also not analysed to determine whether or not they influenced servitization outcomes or the servitization capabilities implemented by a company.

This study, although incorporating some statistical data, is primarily qualitative in nature and therefore did not require a large sample size. Only servitized South African manufacturing companies listed on the Johannesburg Stock Exchange were included in the local sample. The ENA sample consisted only of servitized manufacturing companies listed on the stock exchanges of countries most frequently referenced in the existing servitization literature.

The sources of data analysed were the sampled company annual reports, their company websites, as well as websites that contained information on stock exchange-listed companies. The content analysis and coding, however, were limited to the annual reports of the sampled companies. Other research tools such as interviews and surveys were not utilised as they have already been widely applied in the existing literature. Furthermore, this method would have limited the sample to only the companies that agreed to participate in the research. This could have exposed the research to non-response bias whereas, with the content analysis of annual reports, non-response bias was eliminated.

1.7 Outline of Chapters

Chapter 1: The background for the research is provided and a problem statement is shared. The research question and objectives are also introduced.

Chapter 2: The literature is reviewed and information is collected on existing servitization capability research. Gaps in the existing literature are identified. A servitization capability framework is produced using data from the existing literature.

Chapter 3: The research methodology is presented. Content analysis is introduced as the research method and the annual report is selected as the sampling unit. Ten South African annual reports and ten ENA annual reports are sampled. A coding scheme is designed and codes are applied to the relevant sentences within the sampled annual reports. A method for proving reliability is discussed.

Chapter 4: Statistical data is processed and presented in the form of bar graphs, scatter plots and moonplots. Textual data is also analysed. The results of the reliability test are also presented.

Chapter 5: Key findings are shared. The results are also interpreted and the implications of the research results are discussed.

Chapter 6: Recommendations for further research are made. Study limitations are discussed and the study's conclusions are shared.

2 LITERATURE REVIEW

2.1 Introduction

Since the term "servitization" was coined by Vandermerwe and Rada (1988), the output of servitization research has increased steadily. A variety of topics have been covered over the decades, including the stages of servitization, servitization capabilities and the financial performance of servitized firms. The research on servitization capabilities consists of multiple topics which researchers have explored to varying degrees. Still, gaps remain within these topics and opportunities exist to provide companies with more coherent data on the capabilities required for servitization.

2.2 Servitization Capability Research

Although there's been a steady increase in servitization literature exploring the topic of capabilities, much of the research has been qualitative in nature and limited in terms of the research methods employed. The research methods typically used tend to rely on responses from employees at the sampled manufacturing companies. For instance, to conduct their research, Kanninen et al. (2017) and Lütjen et al. (2017) used the case study method, Baines and Shi, (2015) used a Delphi study, whilst Gebauer et al., (2010) used surveys and equation modelling for the data analysis. The observed trend across the literature is that case studies, interviews and surveys are the most frequently applied methods for servitization research. This assertion is supported by Jovanovic et al. (2019) who point out that most studies on servitization capabilities tend to be case studies that are often based on qualitative interview analysis.

Although the case study method is valid for gaining new knowledge on a specific phenomenon (Eisenhardt, 1989), as with any other method, validation of research results adds to its credibility. In some instances, although the case study method was used as the primary method for the research, a secondary method was used to validate or support the results. Lütjen et al. (2017) validate their own research results by analysing the contents of annual reports, whilst Kanninen et al., (2017) use the analysis of company financial statements and reports to further inform their research. It would thus appear that it may be a worthwhile task to confirm the findings of servitization capability research using the content analysis of annual reports.

The researcher could find only one paper on servitization capabilities that employed the content analysis of annual reports as the primary research method. This paper was by Benedettini (2022). Unlike most research on servitization capabilities, Benedettini (2022) conducted a quantitative study on servitization capabilities in an attempt to validate the existing literature on servitization capabilities. The study was able to produce a five-factor model of capability items (Benedettini, 2022). The paper by Benedettini (2022) further proves that the analysis of annual reports can be used to measure servitization capabilities.

Although Benedettini's (2022) paper provides much-needed empirical evidence on servitization capabilities, the focus on one industry, defence, means that the data cannot be generalised. The choice to limit the study may have allowed the researcher to control for industry-specific factors, however, this limitation means that it remains unclear whether the results presented by Benedettini, (2022) can be applied to other industries. Additionally, Benedettini (2022) did not just focus on capabilities that existed exclusively

for the provision of services, instead, they included generic capabilities that could also be adopted for the provision of physical goods. Although Benedettini (2022) claims that this is done to avoid an overlap between capabilities, this approach makes it difficult to decipher whether a specific capability was established particularly for the provision of services. This is an important distinction to make as one of the aims of servitization capability research is to determine which capabilities facilitate the successful provision of services. Therefore, a gap exists for a study to be conducted using similar methods to those applied by Benedettini (2022) but with a focus on capabilities established exclusively for the provision of services.

The research method is not the only factor that may influence the outcome of a study. Some researchers (Baines and Shi, 2015; Kanninen et al., 2017) have acknowledged that the country where a study is conducted may influence the outcomes of the research. These researchers subsequently encouraged others to conduct further servitization research in different regions. Although it may not necessarily be the case that country-specific factors would significantly affect findings on servitization capabilities, it would be worthwhile to confirm that the results from studies conducted in specific countries can be applied across different regions where cultures may differ.

Although studies have been done on servitization within the South African context, they are few and far between. These studies do not focus on servitization capabilities specifically, are limited in scope and also rely on a single company case study as their research method (Benade and Weeks, 2010; Weeks, 2011; Weeks and Benade, 2015, 2009). The findings from this research, however, suggest that there is a correlation between servitization strategies implemented in the South African context and servitization theory presented in the literature (Weeks, 2011). Still, gaps remain that require additional research to be conducted to confirm this correlation.

2.3 Capability Framework

A capability framework was established to inform the coding scheme later used for content analysis. To do this, servitization capabilities were considered within a servitization maturity model. Considering servitization capabilities within the context of the stages of servitization could help companies determine which capabilities they need to establish at particular stages of their servitization journey. It may also be the case that not all manufacturing companies want to make the full transition from being a product-centric company to a service-centric company. These companies may opt to establish only the capabilities associated with the stages of servitization they wish to reach. As such, some companies may not deem it necessary to establish all of the servitization capabilities that the researcher has identified.

2.3.1 The stage of servitization

The available literature on the stages of servitization is limited and not well integrated. Some researchers focus on the stages involved in developing services (Helm and Graf, 2018), whilst others assess the stages of servitization by considering whether the manufacturer is producing product-support services only or is providing innovative solutions as well (Lütjen et al., 2017). Where some researchers also focus on the stages of organisational transformation (Baines et al., 2020; Ziaee Bigdeli and Baines, 2017), others zoom in on the stages of servitization

as they relate to ICT capabilities (Lerch and Gotsch, 2015). This large variation in the manner in which the stages of servitization are considered, presented some challenges for the researcher. The decision was made to incorporate as far as possible the stages that had been identified across the literature.

The following stages of servitization have been identified:

Stage 1: Fostering a culture of servitization

A review of the literature reveals the importance of company culture during the process of servitization. Researchers such as Coreynen et al. (2018), Bowen et al. (1989), Baik et al. (2019), Gebauer et al., (2010) and Kohtamaki et al. (2015) emphasize the power of a service culture to positively affect the servitization process, leading to its success and financial gains.

This stage was identified as the starting point because successful implementation establishes a foundation for other stages. This stage requires that the firm shifts its focus from being product-oriented to being service-oriented. The values and culture of the firm must also shift towards recognising and appreciating the importance and value of service offerings. When employees have an understanding of the value of service offerings and possess an appreciation for the unique approach required to offer services (compared to products) the first stage has been satisfied.

Stage 2: Knowledge gathering and sharing

The gathering and exchange of knowledge are widely mentioned in servitization literature. Scholars frequently mention the importance of knowledge gathering and sharing within the organisation and amongst employees, with some claiming that this helps to create cohesiveness and cooperation amongst colleagues (Bettencourt et al., 2002; Lievens et al., 1999; Oliveira and von Hippel, 2011; Ordanini and Parasuraman, 2011; Stevens and Dimitriadis, 2005; Vermeulen et al., 2005). Communication and knowledge gathering is not limited to the company's internal operations, instead gathering information on the client is considered to be a critical component of developing services. A company looking to introduce service offerings is encouraged to spend time learning about a customer's business strategy, operations and capabilities (Cooper and Edgett, 2003; Kanninen et al., 2017; Neu and Brown, 2005; Salunke and Weerawardena, 2014).

From the literature, it has been deduced that the knowledge-gathering and sharing stage is comprised of two aspects. The first is the gathering and sharing of knowledge within the organisation. Colleagues in this stage are encouraged to share their expertise and knowledge amongst themselves in order to encourage teamwork and cohesiveness (Jovanovic et al., 2019; Stevens and Dimitriadis, 2005). Ongoing learning and the gathering of information is also recognised as a practice that is necessary for the success of the business' operations (Stevens and Dimitriadis, 2005). The second aspect is a shift towards a customer-centric configuration. Here, care is taken to gain information and learn about the customer's operations, capabilities and business strategy (Coreynen et al., 2018; Helm and Graf, 2018; Stevens and Dimitriadis, 2005). This information is used later on during the service development and delivery stage.

A company is ready to proceed to the next stage once it has gathered sufficient information to be able to create value for its clients. Company processes and systems should also be in place that facilitates the easy exchange of knowledge and expertise among employees. Stage 2 is, however, an ongoing process whereby a company and its employees seek to gain a better understanding of their customers whilst ensuring that information amongst colleagues is freely shared.

Stage 3: Capability development

Capability development is recognised in the literature as an important component of servitization. Scholars present companies with multiple avenues for developing capabilities (Paiola et al., 2013; Wang et al., 2016) and also put forth that capability development is required during more than one of the stages of servitization (Coreynen et al., 2018; Oliva and Kallenberg, 2003), whilst some claim that capability development is an ongoing process (Kanninen et al., 2017).

The literature has led to the identification of certain characteristics of the capability development stage. The development of capabilities appears to be an ongoing process that may come before, after or during service development. During this stage capabilities that are required to develop and deploy services are established (Coreynen et al., 2018). Information on customer capabilities, the company's own capabilities and the capabilities of others in its network are important as decisions must be made on which capabilities to develop internally and which capabilities to develop as intra-firm capabilities (Paiola et al., 2013).

This stage does not have an exit criterion because capability development is an ongoing process. Companies are required to continuously build on their capabilities as their business grows and expands. However, there are capabilities that must be established before a company moves to the service expansion stage and those capabilities are mentioned in section 2.3.2.

Stage 4: Service development and delivery

The preceding stages lay a foundation for the service development and delivery stage. A review of the literature reveals the importance of customer input during the process of service development (Bettencourt et al., 2013; Brax and Jonsson, 2009; Helm and Graf, 2018; Kanninen et al., 2017; Matthyssens and Vandenbempt, 2007; Skålén et al., 2015; Storbacka, 2011; Ulaga and Reinartz, 2011). In addition to customer input, companies are encouraged to consider how they value and price their service offerings (Bettencourt et al., 2013; Kanninen et al., 2017; Skålén et al., 2015).

During the service development and delivery stage, knowledge gathered on customer needs and innovative ideas are all used to develop services that add value to the customer. Services are not only developed but they are priced and marketed to the customer. Resources and capabilities are also combined during the development of services. Services in this stage are usually product-centric.

A company is only ready to exit this stage when they have managed to deliver product-support or product-centric services in a manner that is efficient, effective and profitable.

Stage 5: Service expansion

Once the manufacturing company has successfully developed and delivered product-centric services such as installation, repairs and maintenance, it may be ready to expand its offerings to more advanced services. Whilst some scholars view this move as a necessary step in the servitization process (Baines and Shi, 2015), businesses that decide that they are ready to progress to this stage must ensure that they have considered the risk associated with this move (Baines and Shi, 2015).

The priority with advanced services is to provide customers with solutions and sometimes involves taking over aspects of a customer's operations. The goal during this stage is to create service solutions that provide added value to the customer. Unlike in Stage 4, services are not priced using costing and competitor prices as a guideline, instead, value-based pricing (VBP) and value-based selling (VBS) are applied, where the perceived value that the customers derive from the services is used as a basis for pricing and selling (Kanninen et al., 2017; Skålén et al., 2015).

The literature does not specify an exit criterion for the final stage of servitization. This might be because there are, potentially, limitless opportunities that exist for service expansion.

2.3.2 Servitization Capabilities in the Maturity Model

Each of the stages of servitization requires certain minimum or foundational capabilities. While the capabilities are allocated to specific stages (Table 2.3.1-1) these capabilities may be relevant to multiple stages of servitization. There is however disagreement about which capabilities are required in which stages of servitization. For example, service delivery infrastructure is considered by some as necessary in Stage 4 of servitization (Kanninen et al., 2017) whereas other researchers, such as Lütjen et al. (2017), disagree. They argue that new service infrastructures are only required in Stage 5 when advanced services are introduced because existing structures are sufficient for product-support services. Similarly, some academics mention the importance of innovation capabilities during earlier stages of servitization, whilst others emphasise the importance of this capability during the development of advanced services.

Table 2.3.1-1: Servitization capability framework

Stage	Capabilities
Stage 1: Fostering a culture of servitization	***Service-oriented culture:*** The ability to foster a culture where employees embrace servitization and recognise services as crucial to the company's success. Structures and resources are put in place to support the provisioning of services.
Stage 2: Knowledge gathering and exchange	***Data gathering and exchange:*** The ability to gather information regarding the customer's operations and business strategy. This information along with the knowledge and expertise of employees and customers is exchanged within the organisation. ***Customer-centric configuration:*** The ability to create solutions and service products keeping the customer's capabilities, business model and strategy in mind. This includes the ability to collaborate with the customer effectively.
Stage 3: Capability development	***Network management:*** The ability to create and leverage relationships with partners and customers thus allowing for the sharing of knowledge, capabilities and other resources required (directly or indirectly) for servitization.
Stage 4: Service development and delivery	***Service delivery infrastructure:*** The processes and structures in the organisation are established for the design, development and delivery of services. Includes changes to human resources and management structures to facilitate service development and delivery. ***Digitalisation:*** The ability to use ICT systems to simplify data processing, administrative tasks and other company operations.
Stage 5*:* Service expansion	***Customisation:*** The ability to tailor service offerings according to a customer's unique needs. ***Innovation:*** The ability to introduce new ideas, designs and processes to improve services. ***Value-based pricing and selling:*** The ability to develop services that add value and then recognise and communicate that value in one's service offering. This ability then allows for the company to price service offerings based on their perceived value and not costs and mark-ups. ***Risk management:*** The ability to assess and manage risks associated with a service offering.

The following capabilities for servitization were been identified:

Service-oriented culture

In a service-oriented culture, the organisation and its employees recognise the importance of services to the company strategy. Benade and Weeks (2010) and Kanninen et al. (2017) describe a service-oriented mindset as a prerequisite for

servitization. The company's values and the manner in which employees interact are intended to promote activities that support successful servitization efforts. A service-oriented culture is not just about the organisation's attitude towards services but is also about putting structures, processes and budgets in place specifically for services (Baines and Shi, 2015; Lütjen et al., 2017). Although some of the literature suggests that a service-oriented culture should be established during the first stage of servitization, it is required throughout all five stages of servitization.

Data gathering and exchange

Data gathering and exchange is an important capability during Stage 2. This capability refers to the ability of a company to diffuse information throughout an organisation. Employees should be able to exchange ideas and expertise freely across departments. The ability to exchange knowledge and expertise is cited as necessary in order to achieve good performance amongst employees. (Stevens and Dimitriadis, 2005). The gathering of knowledge must however also extend to learning about the processes and business strategies of customers (Stevens and Dimitriadis, 2005). Another important result of quality communication between the vendor and the customer is that customers have realistic expectations of what the vendor can offer (Bower et al., 2000; Lievens et al., 1999; Wyatt, 2000).

Customer-centric configuration

This capability refers to a company's ability to design services from the perspective of the customer. Those with a customer-centric configuration actively seek to understand the needs and goals of the customer and then use this information to resolve their customer's challenges (Lütjen et al., 2017; Neu and Brown, 2005). One needs customer knowledge to develop a customer-centric configuration, but it is also this configuration that promotes the activity of seeking to understand the customer's perspective.

Network management

A company's network includes its customers, vendors and partners. The managing of a company's network is crucial during the capability development stage (Stage 3) as this network can be leveraged so that intra-firm capabilities can be developed. Sjödin et al. (2016) consider network management as an important component of deploying product-service combinations whilst Jovanovic et al. (2019) mention partner knowledge and understanding as an aspect of the value network. The value network can also provide dependable access to suppliers and customers (Jovanovic et al., 2019) and through this access, one can leverage the capabilities of others or co-develop service capabilities with partners.

Customisation

During the service development stage, consideration is given to options for the customisation of services. In their study, Lütjen et al. (2017) found that some firms opted to establish service development departments with staff who are qualified to provide custom solutions. In addition to having qualified staff, the ability to

customise on a mass scale is an important capability for a product-service company to have (Jovanovic et al., 2019; Sjödin et al., 2016).

Service development and delivery

The service development and delivery capability entails having structures, processes and human resources in place required for the design, development, and delivery of services (Kanninen et al., 2017). This also includes establishing separate management structures for service offerings (Kanninen et al., 2017). The human resources department may be required to change its recruitment, development and compensation principles (Homburg et al., 2003).

Digitalisation

Using ICT and other technological means to improve the way in which data is accessed, shared and processed is a foundational capability that can be useful in improving the company's effectiveness and efficiency (Jovanovic et al., 2019). The importance of ICT capabilities is not limited to administrative activities. Kanninen et al. (2017) suggest that ICT tools support service design and service delivery. Sjödin et al. (2016) added that the capability to deploy product-service combinations is related to digitalisation. According to case firms studied by Kanninen et al. (2017) service sale improvements are said to be contingent on the upgrading of ICT systems whilst Baines et al. (2020) argue that progression, in general, is affected by the availability and access to digital technologies. These findings are supported by Weeks and Benade (2015).

Innovation

The ability to introduce new ideas and processes is required for the development of advanced services. This capability must be established during Stage 5 of servitization because it will allow for unique and effective services to be developed (Neu and Brown, 2005; Windahl et al., 2004; Baines and Shi, 2015). Although the literature refers to the innovation capability during the later stages of servitization, it may be beneficial to develop this capability earlier as it determines how the company’s resources and capabilities are re-arranged (Edvardsson et al., 2013).

Value-based pricing and selling

When advanced services are offered, the vendor is now selling solutions that add value to the customer’s operations (Baines et al., 2020). The use of costings and markups to price services is no longer suitable. Instead, vendors must understand their customer’s value drivers (Kanninen et al., 2017) and use customer information to develop a new revenue mechanism (Kanninen et al., 2017). The vendor can then price the service based on the perceived value whilst being sure to communicate the benefits of the services being developed (Lievens et al., 1999; Stevens and Dimitriadis, 2005).

Risk management

Advanced services require the vendor to assume more complex tasks that may significantly affect both the vendor and the customer's operations. As such, greater responsibility is placed on the vendor and with that, associated risks are magnified (Baines and Shi, 2015). Unlike product-centric services for which the associated risk is minimised, advanced services require active risk management because the vendor assumes responsibility for the availability of the asset and its performance (Baines and Shi, 2015). As such, during Stage 5 of servitization, the capability to manage risk is critical.

The capability framework (Table 2.3.1-1) consists of five stages of servitization and ten capabilities. Some of the capabilities included in Table 2.3.1-1 have been classified in the literature as either operational, dynamic or advanced service capabilities. The capability framework, however, does not make this distinction, instead capabilities are classified according to the stage of servitization where they may be most useful. Companies who wish to only provide product-centric services, may not need to establish the value-based pricing and selling capability as that is only required in Stage 5 of servitization when advanced services are introduced. The omission of certain capabilities and the emphasis on others may thus serve as an indication of the extent that a company is servitized. Appendix A contains more detailed tables that provide some of the evidence for the findings of Table 2.3.1-1.

2.4 Conclusion

Servitization is a multi-faceted phenomenon that is gaining popularity amongst companies whilst garnering increasing attention from scholars. The process often consists of multiple stages during which specific objectives exist and certain capabilities are required. An understanding of the servitization stage a company is currently in, the capabilities they already possess as well as the capabilities they need to develop is invaluable when determining a company's ability to successfully implement servitization. Unfortunately, most of the research on servitization is conducted outside of the African continent. More research within the context of developing nations, more specifically South Africa, is required so that similarities and disparities can be identified thus further informing the scientific community and companies alike.

The tendency of servitization capability researchers to use case studies and interviews as a research method means that a lot of the existing research cannot be generalised. The available data, often collected using case studies and interviews, is also rarely validated using alternative research methods. A gap exists for researchers to conduct further studies to confirm the existing findings.

3 RESEARCH METHODOLOGY

3.1 Introduction

The research methodology chapter aims to demonstrate the process used by the researcher to answer the research question and achieve the related objectives. The research question was concerned with determining the extent to which servitization capabilities implemented at selected servitized South African manufacturing companies correlated with the existing literature. Correlation in this context means a relationship or connection between the servitization literature and servitization capabilities as they exist in practice. As the majority of the servitization literature available is based on information collected in ENA countries, the researcher considered that it would be insightful to compare findings from the South African sample to findings from the ENA sample. To answer the research question, the researcher had to decide on a suitable research methodology. Important factors were the sample size and the selection of companies that would be included in the sample. Additionally, the researcher applied measures to ensure the reliability and validity of the research approach taken.

3.2 Research Design

The strategies and methods utilised during the course of this research project were critical in ensuring that the integrity of the research was assured and the subsequent results were able to withstand scrutiny. There are various approaches that can be utilised when conducting research. Therefore, based on the research question the form of data that would best meet these objectives should be chosen, i.e., quantitative vs qualitative research as well as the manner of investigation, i.e., an inductive, deductive or abductive approach.

Quantitative research utilises variables that can be analysed according to discreet data to produce results (Apuke, 2017). Quantitative research can be used to answer who, what, when and how questions but is not usually effective at answering why questions (Apuke, 2017). Leedy and Ormrod (2001) offer three broad classifications of quantitative research including experimental, descriptive and casual comparative. The field experiment approach allows the researcher to spend time in a real-life setting (Almeida et al., 2017). The researcher then introduces one or more variables that are manipulated so that the results can be observed (Almeida et al., 2017). With descriptive research, on the other hand, the variables remain uncontrolled and observation is the method by which attributes of a phenomenon are identified (Williams, 2007). The casual comparative method enables the researcher to compare the effect of independent variables on dependent variables (Williams, 2007). Casual comparative research is best-suited to study cause-and-effect relationships (Apuke, 2017).

Although Leedy and Ormrod (2001) presents only three classifications for quantitative research, others researchers identify two others, namely correlation and survey research (Almeida et al., 2017; Apuke, 2017). Though correlation may be confused with casual comparative research, the two methods have distinct differences. Correlation research studies the degree to which two or more variables are related (Kravitz, 1994). Casual comparative research involves two or more groups as well as one independent variable, whilst correlation research investigates two or more variables within one group (Gay and Airasian, 2000). For those researchers who are looking to measure a particular population's characteristics through the use of statistical methods, surveys are a good option (Apuke,

2017). Survey research entails the use of questionnaires to gather information from a section of the population. This information is later used to generalise to the whole population (Apuke, 2017).

An alternative to quantitative research is qualitative research. Leedy and Ormrod (2001) recommend five qualitative research methods including grounded theory, phenomenology, ethnography, case study and content analysis.

Grounded theory is the practice of collecting data, analysing it and repeating the process until a theory is derived solely from the collected data (Williams, 2007). This method requires an investment in time and is also typically used in the discipline of sociology because it examines people's actions and interactions. While this method is beneficial for research that is conducted over an extended period of time (perhaps a few years), it was not viable for this study which was conducted over a few months.

Phenomenology is concerned with understanding experiences from the point of view of the participants (Leedy and Ormrod, 2001). While this approach can contribute additional information regarding the experiences of personnel at companies undergoing servitization, it was not applicable to this study as the focus was solely on servitization capabilities and not on personnel experience.

Ethnography is often used to study an entire group that shares a culture (Leedy and Ormrod, 2001) and requires the researcher to study the group over a prolonged period of time (Creswell, 2003). As this study focused solely on servitization capabilities and was conducted over a short time frame, ethnography was not considered to be a suitable approach.

The case study method is defined by Creswell (2003) as the "in-depth exploration of a program, an event, an activity, a process or one or more individuals". The case study must either be a single case or a case bounded by place and time (Creswell, 2003). This method was not considered, as a single case would not provide enough information required to answer the research question and a multi-case study would require more time than this study permits. In addition, as explained in Chapter Two, the majority of the research on servitization capability research employs the case study method. Therefore, in order to contribute new information to the literature an alternative research method is required. The case study method was thus eliminated as a research method for this study.

Content analysis is defined by Krippendorff (2004) as "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use". Although content analysis is often applied to bodies of text, one may include works of art, images, symbols, signs, sounds and maps as data suitable for content analysis (Krippendorff, 2004). Content analysis is a scientific tool that is expected to be replicable and reliable (Krippendorff, 2004). Multiple qualitative methods could be used to answer the research question, however very seldom has content analysis of company documents been used to collect data on servitization capabilities. This makes the content analysis of company documents a suitable method to potentially confirm the existing data on servitization capabilities. In addition to this, Leites and Pool (1942) put forth that one of the uses of content analysis is to confirm what is already believed.

The research question is concerned with determining the extent of the correlation between the literature and the applied servitization capabilities at selected servitized manufacturing companies. The intention is not to generalise the findings to the greater population of companies.

Content analysis is considered to be unobtrusive. Unlike case studies and interviews, the source material to be analysed by the researcher was not produced with this study in mind. Furthermore, it is unlikely that the creators of the source material would have given any consideration to how the information contained in the material might be used by a researcher studying servitization capabilities. It is also valuable to note the effect that a blind approach (where the researcher does not interact directly with the executives providing the information) has on the data collected. Should the results be found to be similar, this would further validate the existing servitization capability research that has largely been conducted using the case study method. Therefore, the researcher has chosen content analysis as the research method suitable to answer the research question.

Although the researcher decided to employ content analysis as the research method, the research design is not complete without considering whether an inductive or deductive approach should be taken. Inductive research is suitable for studies where the objective is to establish a new theory often in the form of a conceptual framework (Saunders et al., 2009). The researcher will often collect qualitative data using tools such as interviews and participant observation; in this way, the sterile rigid methodology required for deductive research is avoided. In inductive research, a small sample size is considered to be more appropriate.

Deductive research aims to explain the relationship between concepts and variables whilst enabling facts to be measured quantitatively (Saunders et al., 2009). Deductive research is suitable for instances where lots of research is available on a topic and a theory can be formulated (Saunders et al., 2009). The researcher then uses the existing literature to specify the conditions under-which the theory should hold. The research typically uses a highly structured methodology to aid replication (Saunders et al., 2009). Where content analysis is concerned, a deductive approach is one where the researcher uses concepts defined in the research to develop the coding scheme. As the researcher employed the capability framework of Chapter Two to formulate the coding scheme, the research approach taken by the researcher can be considered to be deductive.

To summarise the research approach, content analysis was the specific research method employed and a deductive approach was taken.

3.3 Sampling Methods

The use of content analysis requires that a sampling unit be selected. In addition to the sampling unit, however, a sample of companies participating in the study must also be collected. This is a critical part of research as selecting the incorrect sample size of participants can negatively impact the credibility of the study.

Qualitative research and quantitative research both have their unique approach to sampling, where requirements vary. Qualitative research is associated with non-random sampling and smaller sample sizes whilst quantitative research is associated with random sampling and larger sample sizes (Onwuegbuzie and Collins, 2007). In the vast majority of mixed

methods research, however, non-random sampling is used for both the qualitative and the quantitative aspects of the research (Onwuegbuzie and Collins, 2007).

The objectives of the study determine the way in which sampling is done. If the objective is to generalise the findings to the greater population then the sample size must be large enough so that data saturation in the results is achieved (Vasileiou et al., 2018). If generalisation of data is required, then the sample must also consist of randomly selected participants (Onwuegbuzie and Collins, 2007). This study does not intend to use its findings to make generalisations, instead, its aim is to gain insights into servitization capabilities at the selected companies. As a result, purposive, non-random sampling was employed by the researcher.

3.3.1 Sampling unit

The type of information that the study aimed to collect and the time available to conduct the research were some of the factors considered when deciding on the sampling unit. For the reasons mentioned below, the integrated annual report was considered to be a good source of information on the existing servitization capabilities of the sampled companies. Although annual reports are also prepared using the information provided by company executives, unlike an interview or survey, the information shared in an annual report is often shared without the researcher in mind. Additionally, annual reports are often considered a primary source of a company's financial and operating information for investors and shareholders (Michalisin, 2001). Annual reports are also prepared according to specific guidelines and standards, which contributes to their credibility and comparability. Still, information from annual reports can only be used for research purposes if it is considered accurate and reliable. Research done on the validity of assertions made in annual reports, though not extensive, so far shows that the information contained in them is reliable and valid (Bowman, 1978; Bowman and Haire, 1976; Michalisin, 2001).

Although integrated annual reports are prepared with significant input from executives, unlike with case study or interview research methods, the researcher has no direct interaction with the executives and the information gathered from integrated annual reports is not produced with the researcher in mind. This means that there is no way for the information on servitization capabilities contained in integrated annual reports to be tailored consciously or subconsciously by the executives specifically for the researcher's study.

Using integrated annual reports as a source of data also means that the sample size is not limited by the willingness of companies to participate in the study. Integrated annual reports are often freely available for download from a company's website. However, it is often the case that each company publishes multiple annual reports, corresponding with the number of years that a company has been listed on a stock exchange. Due to time constraints, the researcher opted to limit the samples to only the latest annual report per company.

While annual reports have been used in the existing literature, they have sometimes been found to be biased (Merkl-Davies and Brennan, 2011; Moreno and Jones, 2022). To reduce the inclusion of bias statements in the data, the researcher

designed coding rules that do not facilitate the coding of forward-looking statements as well as vague statements without a clear context. The statements that were coded referred to existing capabilities that could be verified through other means.

At the beginning of each integrated annual report, the relevant company states that the compilation of the report is informed by guidelines and standards such as those set by the International Integrated Reporting Framework, the Value Reporting Foundation's Framework, or the International Financial Reporting Standards. These guidelines ensure that integrated annual reports contain specific information that may be of interest to stakeholders. The International Integrated Reporting council, whose International Integrated Reporting Framework was the most widely used amongst the sampled companies, has stipulated an aim for the integrated annual report. The council puts forth that the aim of an integrated report is to provide "a concise communication about how a company's strategy, governance, performance and prospects, in the context of its external environment, lead to the creation of value over the short, medium and long term" (IIRC, 2013). As they used similar guidelines, the integrated annual reports of the sampled companies were fairly consistent in the way they were structured and had chapters addressing similar topics. The fact that most annual reports are compiled within certain guidelines adds some credibility to their contents. It also means that integrated reports, to a certain extent, are a reliable way to compare companies to each other as they report on standardised topics.

The aim of this study is to determine to what extent servitization capabilities are implemented at the selected companies. Although integrated annual reports do not usually have chapters or sections dedicated specifically to discussing a company's capabilities, the topics typically covered present opportunities for companies to reveal information regarding their capabilities. Annual reports contain information on the company's performance over the previous financial year, and related to that are the company's operations and factors that influenced their outcomes. Within this context, existing capabilities may be discussed. Annual reports are therefore a potentially good sources of information regarding a company's existing capabilities.

3.3.2 Sample inclusion criteria

In order to identify a sample of companies that would be included in the study, a criterion for inclusion was determined. Only companies listed on the JSE were considered for participation. This was done for a variety of reasons. Firstly, the time available to the researcher required that the sample size be limited. Secondly, all companies listed on the JSE are required to have a subscribed capital of at least R50 000 000 and a minimum audited profit of at least R15 000 000 for the most recent year preceding the company's listing on the JSE ("Guidelines to Listing on the JSE," n.d.). This means that the companies listed on the JSE are not typically what one would consider a "small" company. This eliminates the variable of company size which has been shown in previous research to influence the outcome of servitization (Neely, 2008).

A participating company must also have its main stock exchange listing or main headquarters in South Africa. This will ensure that the company is considered "South African-based" even if it has operations in other countries.

The last criterion for inclusion is that a company must be a manufacturer that also offers at least one service. If a company has multiple subsidiaries, all the subsidiaries of the company should either manufacture products or offer services that support the manufacturing activities of their fellow subsidiaries either directly or indirectly. Subsidiaries can also be involved in both manufacturing and the offering of services. In the event that a company has multiple subsidiaries involved in different activities across multiple industries, and the subsidiaries appear to be structured so that they operate independently of each other, the company would be excluded from the sample. This exclusion would occur regardless of whether some of the subsidiaries are manufacturers or servitized manufacturers. The exclusions based on the above-mentioned criteria would be made because companies with multiple subsidiaries operating across multiple industries and whose operations appear unrelated would be too complex to analyse. It would be challenging to determine the specific contexts of the integrated annual report's contents.

3.3.3 Sampled South African companies

The Excel spreadsheet of listed companies from the JSE website, accessed on the 7th of June 2022, contained the details of 302 companies. The list of 302 companies needed to be further narrowed to limit the sample to only companies with manufacturing operations. The JSE utilises the FTSE Russell ICB structure to classify all its listed instruments into eleven Industries and 45 Sectors ("Industry Classification Benchmark (ICB)," n.d.). However, the researcher encountered difficulty in finding any grouping of companies using these classifications on the JSE website itself. Instead, the researcher referred to two websites, www.moneyweb.co.za and www.sharedata.co.za which provided listings of JSE instruments according to their sectors. The two websites only presented 38 sectors out of 45, suggesting that there were no companies listed on the JSE that belonged to the seven sectors that were excluded.

Although companies were grouped according to their sectors on the Moneyweb and Sharedata websites, the FTSE Russell Ground Rules Industry Classification Benchmark (Equity) v3.9 document only provides definitions for sub-sectors and not sectors. As no definitions were given for sectors, a decision was made to include a sector in the sample if the definition for one or more of its sub-sectors mentioned any manufacturing or production activities. Sub-sector definitions from the FTSE Russell Ground Rules "Industry Classification Benchmark (Equity) v3.9" were reviewed and used to determine which sectors to include in the sampling process.

Any sub-sectors with the words "manufacture" or "manufacturing" in their description indicated that their corresponding sector could be included in the sample. The word "maker" was taken to be closely related enough to the word "manufacture" that a sector with a sub-sector defined using this word was included. The words "production" and "produce" although not having the same meaning as "manufacturing", are closely associated enough that a sub-sector that was defined using those words was included in the sample for further analysis. In instances

where a sub-sector was defined using the words "production" and "produce" in reference to mineral processing, the definition was not considered to be representative of manufacturing activities and the corresponding sector was excluded if no other sub-sector described manufacturing activities. Sectors which were excluded on this basis were the "Oil, Gas and Coal" and "Precious Metal and Mining" sectors.

To demonstrate the above, the "Alternative Energy" sector wass identified on both the Moneyweb and Sharedata websites as seen in figures one and two.

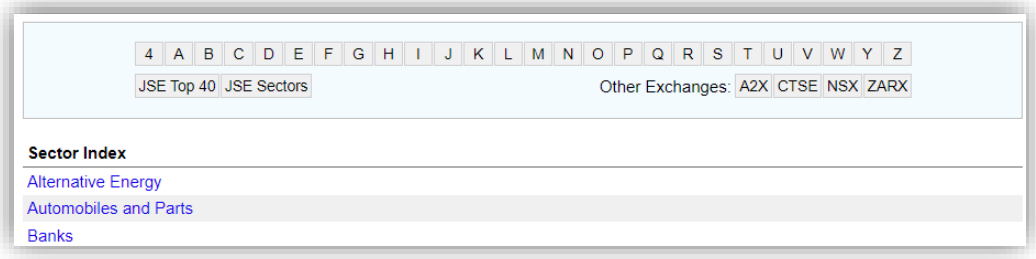


Figure 3.3.3-1: Some of the sectors on the Sharedata website

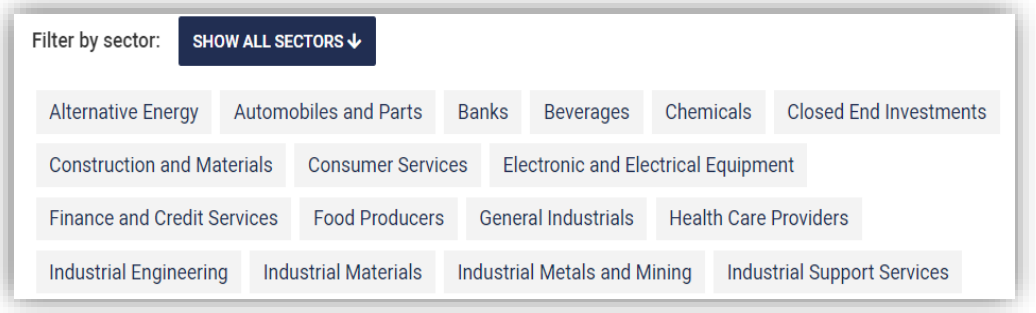
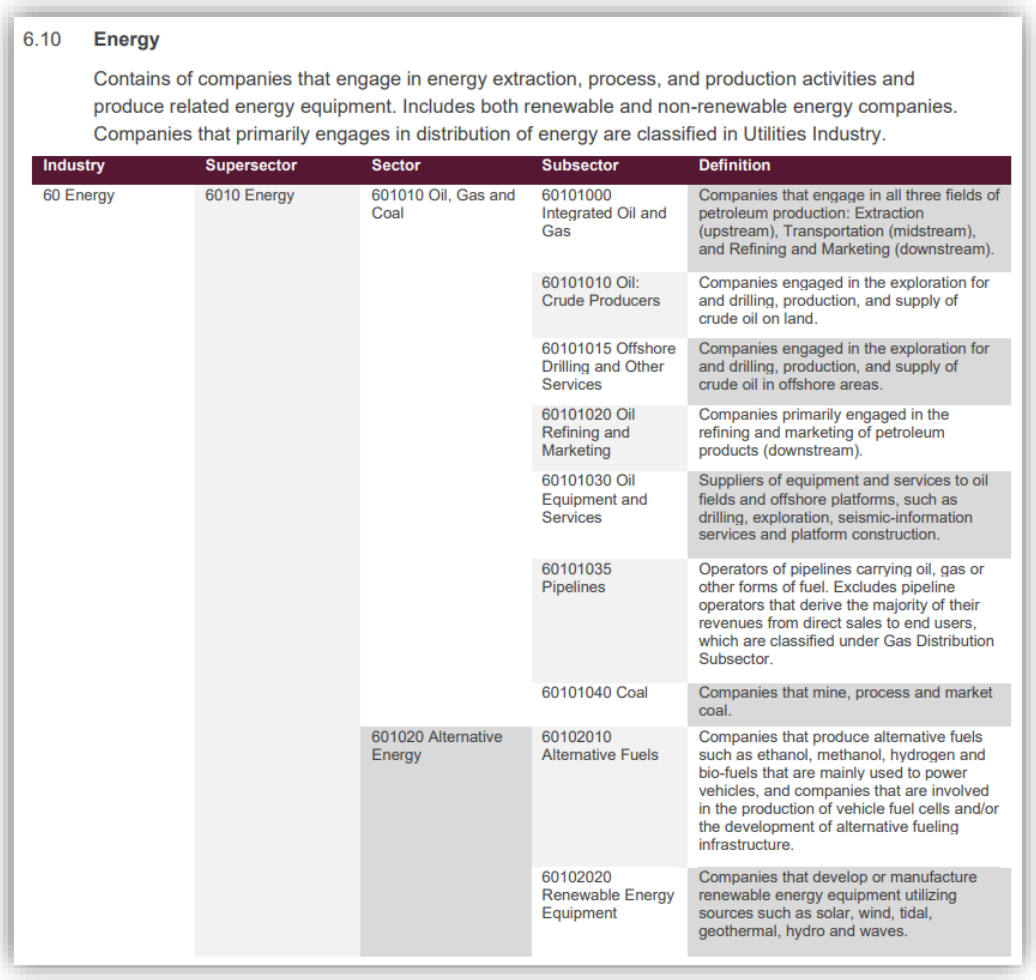


Figure 3.3.3-2: Some of the sectors on the Moneyweb website

A reference to the FTSE Russell Ground rules document, as seen in figure 3.3.3-3, shows that the "Alternative Energy" sector does not have a definition, however, it is comprised of two sub-sectors which are defined. The "Alternative Fuels" sub-sector definition contains the words "produce" and "production" whilst the "Renewable Energy Equipment" sub-sector definition contains the word "manufacture". Within the context of their sentences, the identified words indicate that the companies within these sub-sectors engage in production and/or manufacturing activities. Based on this, the "Alternative Energy" sector was included in the sample.



6.10 **Energy**

Contains of companies that engage in energy extraction, process, and production activities and produce related energy equipment. Includes both renewable and non-renewable energy companies. Companies that primarily engages in distribution of energy are classified in Utilities Industry.

Industry	Supersector	Sector	Subsector	Definition
60 Energy	6010 Energy	601010 Oil, Gas and Coal	60101000 Integrated Oil and Gas	Companies that engage in all three fields of petroleum production: Extraction (upstream), Transportation (midstream), and Refining and Marketing (downstream).
			60101010 Oil: Crude Producers	Companies engaged in the exploration for and drilling, production, and supply of crude oil on land.
			60101015 Offshore Drilling and Other Services	Companies engaged in the exploration for and drilling, production, and supply of crude oil in offshore areas.
			60101020 Oil Refining and Marketing	Companies primarily engaged in the refining and marketing of petroleum products (downstream).
			60101030 Oil Equipment and Services	Suppliers of equipment and services to oil fields and offshore platforms, such as drilling, exploration, seismic-information services and platform construction.
			60101035 Pipelines	Operators of pipelines carrying oil, gas or other forms of fuel. Excludes pipeline operators that derive the majority of their revenues from direct sales to end users, which are classified under Gas Distribution Subsector.
			60101040 Coal	Companies that mine, process and market coal.
		601020 Alternative Energy	60102010 Alternative Fuels	Companies that produce alternative fuels such as ethanol, methanol, hydrogen and bio-fuels that are mainly used to power vehicles, and companies that are involved in the production of vehicle fuel cells and/or the development of alternative fueling infrastructure.
			60102020 Renewable Energy Equipment	Companies that develop or manufacture renewable energy equipment utilizing sources such as solar, wind, tidal, geothermal, hydro and waves.

Figure 3.3.3-3: Extract from the FTSE Russell Ground Rules Industry Classification Benchmark (Equity) v3.9

This process was repeated for the 37 remaining sectors until only 18 sectors, comprising of 102 companies remained in the sample. Although companies could have been furthered narrowed down by industry or sector, to include for instance only companies in the Electronic and Electrical Equipment sector, this would have resulted in a sample size far too small to yield any useful results.

The 178 companies remaining in the sample were further classified by reading both the “Nature of Business” summary provided in the company profile on the JSE website as well as the “About” or “Overview” page of the company website. If required, other sections of the company website were scanned manually by the researcher to identify any manufacturing and service activity. Reviewing both mediums was beneficial as some companies did not have a description under the “Nature of Business” section of their JSE listing.

The service activities that the researcher scanned for were informed by Neely's, (2008) paper where they identified twelve types of services often offered by servitized manufacturing companies. These twelve services were used again in a study by Benedettini et al., (2015). The study by Benedettini et al., (2015) found that manually reviewing the descriptions of companies in order to classify them as servitized manufacturers was more accurate than automated coding which was

implemented by Neely (2008). Furthermore, of the companies that were found to be involved in manufacturing and service activities, those whose main headquarters or main stock exchange listings were found to be outside South Africa were excluded from the sample. Four companies were excluded because they were comprised of multiple subsidiaries, that were involved in different (often unrelated) activities, across different industries. The final sample included ten companies. Appendix B.1 provides further details on the companies.

3.3.4 Sampled ENA companies

In addition to the ten sampled South African annual reports, the researcher gathered ten annual reports from companies based in either Europe or North America. The countries were selected based on the references used to create the stages of servitization framework, Appendix A.1, and the references used to create the servitization capability framework, Appendix A.2. Appendix A.3 illustrates the country where the data was collected in each of the referenced studies. The South African references were excluded. From this table, the researcher was able to approximate that 18% of the studies were performed in Germany, 15% each in Finland, Sweden and the United States of America and 9% each in Switzerland and the United Kingdom. Just 18% of the studies were conducted in other countries not already accounted for.

In order to facilitate a fair comparison, 10 ENA-based companies were sampled to match the 10 sampled South African companies. The sample was comprised of two companies each, based in Germany, Finland, Sweden and the United States of America, whilst Switzerland and the United Kingdom accounted for one company each. This split was designed to match, though not exactly, the split found in the references used to formulate the servitization capability framework. Publicly listed companies were randomly selected from the relevant country's stock exchange to be included in the sample. The inclusion criteria used was similar to the one presented in 3.3.2 and differed only in that the companies included in the sample were not required to be listed on the JSE or be headquartered in South Africa. The companies were instead required to be listed on their local stock exchange.

3.4 Data Collection Methods

Once the research method had been selected and the samples collected, the researcher proceeded with collecting data. As content analysis is a scientific method that must be reliable and replicable, the way in which data was collected using this method could not be inconsistent and lacking in justified guidelines.

3.4.1 Recording unit and categories

With the sampling unit having been decided upon, consideration returned to the research question. The question was to determine the extent of the correlation between the servitization capabilities implemented at selected servitized South African manufacturing companies and the servitization capabilities identified in the literature. To answer this question, at least one variable was required. A variable is defined as "a definable and measurable concept that varies; that is, it holds different values for different individual cases or units" (Neuendorf, 2002). The selected

variable was capability, as integrated annual reports may vary in the capabilities that they mention as well as in the frequency of those mentions. Capability is a nominal variable as its categories have no intrinsic order (United States. General Accounting Office. Program Evaluation and Methodology Division, 1996). Categories are also required to be exhaustive and mutually exclusive (Krippendorff, 2004). Ten capability categories were derived from the capability framework of Chapter Two, and they are: a service-oriented culture, data gathering and exchange, customer-centric configuration, network management, service development and delivery, customisation, innovation, digitalisation, value-based pricing and selling and finally, risk management. These capabilities however were not exhaustive as other capabilities may exist that have not been included in the capability framework of Chapter Two. These exclusions are partly due to the limitations in the literature. To address this, an eleventh capability called "other" was added. The "other" category was created in order to satisfy the criteria that the categories used whilst coding be exhaustive. The "other" category signifies any servitization capability that may be identified in an annual report that is not amongst the ten servitization capabilities identified in the capability framework of Chapter Two. Capabilities are also typically considered to be mutually exclusive (Stalk et al., 2012). Therefore, the ten categories, satisfy the criteria for being suitable for content analysis.

With the categories established, the next step was to determine the recording unit. Holsti (1969) defines the recording unit as the "specific segment of content that is characterized by placing it in a given category". The recording unit that the researcher selected was the sentence. Using words as the recording unit would not have provided sufficient context, which is important for this study, and a paragraph might have included information that was not relevant thus making the coding unreliable. Although the sentence worked well as a recording unit for most of the coding, in some instances a sentence referred to more than one capability. In this case, a single sentence would have different portions of it coded to different capabilities.

3.4.2 Context

Content analysis cannot be performed effectively without considering the context. Krippendorff (2004) asserts that "a context is always someone's construction, the conceptual environment of a text, the situation in which it plays a role." Krippendorff (2004) goes on to say that "the context specifies the world in which texts can be related to the analyst's research question". There are two aspects of context that the researcher was required to consider during the coding process. The first was the textual context that a given capability was mentioned within. It was essential to consider whether or not a capability was mentioned in relation to a company's product offerings or service activities. For instance, a company may mention that they have prioritised innovation and have won multiple awards for the innovation of their products. If the innovations are mentioned in a paragraph that describes their manufactured products or the sentence mentioning the innovation capability refers to manufactured products, then the sentence cannot be coded and assigned to the innovation capability category. This is because the context that the capability was mentioned in does not reference services and the definition of the innovation capability in the coding scheme (Appendix C.1) is associated solely with services. In instances where the definition of a capability (as defined in Appendix

C.1) specified service activity as its context, a sentence would not be coded if there was ambiguity regarding whether the capability was mentioned in relation to the development and delivery of manufactured products, their service offerings or other business operations.

The other aspect of context to be considered is the external environmental. It is useful to remember that one of the aims of integrated annual reports is to report on a company within the "context of its external environment" (IIRC, 2013). None of the companies operate in a vacuum and all are vulnerable to factors existing in the environment in which they operate. All the sampled annual reports provided feedback for the 2020/2021 financial year, during which three factors were often mentioned as being of consequence to the South African companies' operating context. The three factors were the Covid-19 pandemic, the July 2020 unrest and the crisis in the Ukraine. The Covid-19 pandemic and the Ukraine crisis were also mentioned by some of the companies in the ENA sample. These events affected the companies to different degrees and introduced variability that the researcher did not intend to address with their research question. That being said, any adaptations, adjustments or changes to a company's service-related activities that were initiated for the first time due to these and other external factors were coded under the "adaptability" capability and assigned to the "other" category.

3.4.3 Coding

In order to facilitate consistent coding, the researcher developed a coding scheme which can be found in Appendix C.1. The codes, categories and descriptions were created using the capability framework of Chapter Two. This coding scheme was intended to act as a guideline for how coding should be performed by the researcher or any other trained coder.

Having established the sampling unit, variable, categories, recording unit and coding scheme, the researcher embarked on analysing and coding the integrated annual reports individually. Each integrated annual report was downloaded in PDF format from the relevant company's website and saved into a folder on the researcher's computer. Each integrated annual report was then imported into a qualitative analysis software tool called QDA Miner Lite. QDA Miner Lite is the free version of QDA Miner which was developed by Provalis Research. It is a computer-assisted qualitative analysis software tool that has features that allow the user to import documents in various formats, retrieve text and code text. It also allows for the analysis of code frequency and allows the user to export this information in the form of tables and charts.

The QDA Miner Lite software required the creation of categories and codes. Every code that was created in the software was assigned to its corresponding category. In some instances, it was not necessary for a category or capability to consist of multiple codes. The innovation capability for instance only had a single code assigned to it: "innovating". A category and code could not have the same name, therefore slight alterations to the wording had to be made. In certain cases, a category/capability had multiple corresponding codes. The data gathering and exchange capability consisted of the "employee engagement" and "customer knowledge" codes. During the coding process, some codes were added along the

way, whilst others were merged. Alterations to the coding scheme were also made to describe any emerging codes and to clarify some ambiguities. Figure 3.4.3-1 illustrates how the codes and categories were represented within the QDA Miner Lite software.

Figure 3.4.3-1: Capabilities and codes in QDA Miner Lite software

Once the codes and categories were created, coding could commence. During the importation of the integrated annual reports into QDA Miner Lite, all images included in the integrated annual report were eliminated. The way in which QDA Miner Lite imported the integrated annual reports made them incoherent in parts, which forced the researcher to read the original PDF of the integrated annual report and then search for the corresponding sentence in the QDA Miner Lite software. Once the sentence was located within the QDA Miner Lite software, it was assigned a code and the code was assigned to a category. The steps taken when coding a sentence can be seen through an example in figures 3.4.3-2, 3.4.3-3 and 3.4.3-4.

Figure 3.4.3-2: Sentence in Nampak integrated annual report that has been identified for coding.

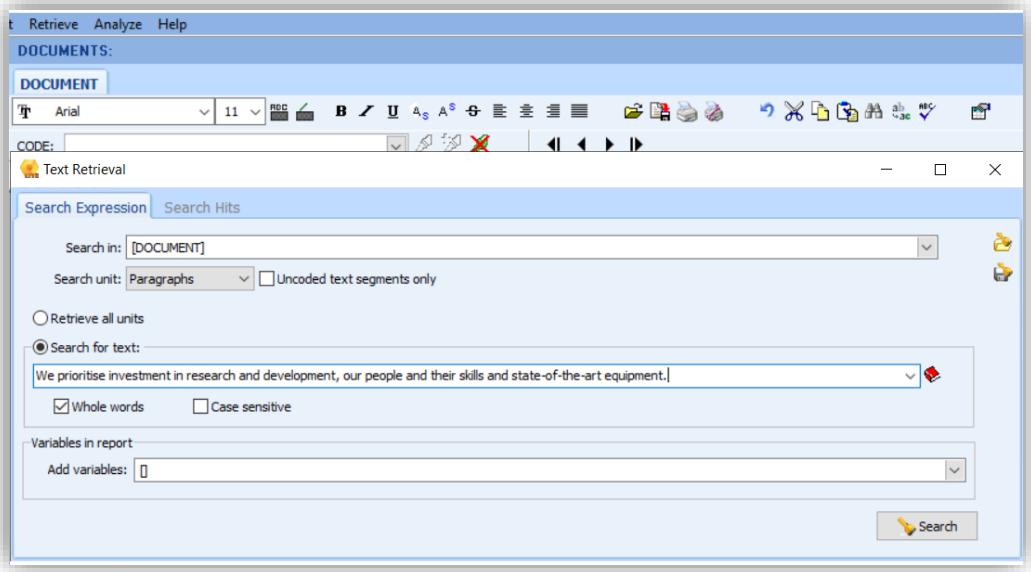


Figure 3.4.3-3: Text from the Nampak integrated annual report is retrieved from the QDA Miner Lite Software

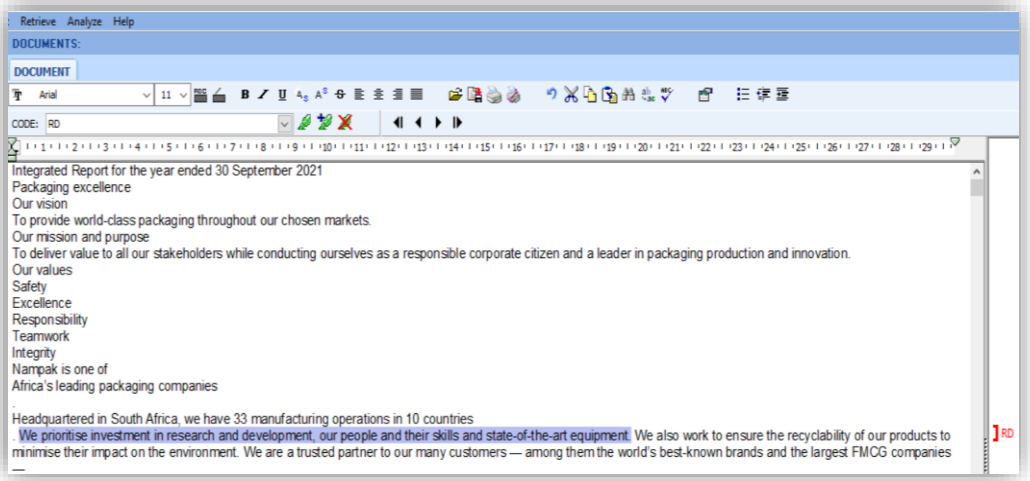


Figure 3.4.3-4: The sentence is coded as "RD" which belongs to the innovation category

It is important to note that any mention of a capability in the future tense or within the context of a forward-looking statement (where merely the intention to establish a capability is expressed) was not coded. The researcher was only interested in

capabilities that had already been established. Similarly, if a capability was mentioned within a context such that it did not match the description of the capability as stipulated in the coding scheme, it was not coded. For example, if risk mitigation was mentioned in reference to a company's liquidity the sentence was not coded as risk management in the coding scheme refers to the assessment, management and mitigation of risk associated with providing services. Finally, where a capability was mentioned multiple times in a single paragraph, it was coded only once.

3.5 Validity and Reliability

In order for the researcher to lend credibility to the study, the researcher was required to prove the validity and reliability of the study. Validity is defined by Krippendorff (2004) as "that quality of research results that leads us to accept them as true, as speaking about the real world of people, phenomena, events, experiences, and actions". However, validity in research is a multi-faceted concept, with many different types of validity that a researcher may choose to place their focus on. For this study, the researcher will consider internal validity but not external validity as they do not intend for their research results to be generalised. According to Andrade (2018) internal validity "examines whether the study design, conduct, and analysis answer the research questions without bias" whilst external validity is concerned with "whether the study findings can be generalized to other contexts".

In order to ensure that internal validity is achieved, Potter and Levine-Donnerstein (1999) suggest that the researcher must first determine the type of content they are coding and to what extent the coding process will require the coder to employ their own interpretations. There are two types of content, manifest content and latent content. Manifest content is easily observable content that, for instance, entails the identification of a particular word in a sentence (Potter and Levine-Donnerstein, 1999). Latent content on the other hand requires the reader to look beyond the words and look for the "meaning underlying the elements on the surface of the words" (Potter and Levine-Donnerstein, 1999). Furthermore, latent content can be categorised as either pattern content or projective content. From the categorisation of the content type put forth by Potter and Levine-Donnerstein (1999), the researcher has identified the content type relevant to this study as a "latent pattern". For latent pattern content, the coding scheme is informed by the theory, whilst the coder is required to recognise patterns during the coding process (Potter and Levine-Donnerstein, 1999). Latent pattern content is unlike manifest content which doesn't require a coding scheme based on the theory and only requires the coder to perform "clerical" coding tasks where interpretation of the data is not required (Potter and Levine-Donnerstein, 1999). The other content type, projective content, is heavily reliant on the coder's schema to construct interpretations of the data and is not deemed suitable for this study (Potter and Levine-Donnerstein, 1999).

To achieve internal validity, the researcher created a coding scheme that was informed by the data gathered and presented in the servitization capability framework of Chapter Two. The coding scheme is required so that any coder that is involved in the research or would like to reproduce the research has a set of guidelines to assist in producing relatively consistent results. In producing the coding scheme the researcher had to strike a balance between writing code descriptions that contained enough information to facilitate consistent coding, but not too much that it would compromise ecological validity (Potter

and Levine-Donnerstein, 1999). Ecological validity refers to whether study findings can be generalized to real-life settings (Andrade, 2018). Although the aim of this research is not to produce generalisable results, a balance must still be struck to ensure that the results are applicable to "real-life" settings. Therefore, a coding scheme that could guide a coder in identifying patterns by assessing symbols and the connections between them was created. However, in the creation of the coding scheme, the researcher avoided creating increasingly detailed, and therefore, complex definitions. Instead, the coder was allowed the opportunity to employ their own schema and make interpretations in order to perform the task of coding.

In addition to validity, the researcher is also required to show reliability. A reliable research procedure is described by Krippendorff (2004) as one that "responds to the same phenomena in the same way regardless of the circumstances of its implementation". Krippendorff (2004) indicates three types of reliability: stability, reproducibility and accuracy. Stability can be proven using the test-retest procedure (Krippendorff, 2004). This procedure involves the researcher coding the data and after some time has passed, ten days, for example, the researcher repeats the coding on the same data. Reproducibility typically entails the coding of the same data by multiple coders, using the same guidelines. Should all the coders produce similar results, the process would then be regarded as reproducible. Accuracy, which is considered to be the best way to judge reliability, assesses the coder's judgement against a standard (Andrade, 2018; Potter and Levine-Donnerstein, 1999). Although accuracy is deemed the best way to determine reliability, it's a requirement for the establishment of a standard that can complicate matters if no agreement can be reached regarding the standard. However, for pattern content the expert can establish the standard (Potter and Levine-Donnerstein, 1999). The researcher for this paper's study is considered the "expert", thus their coding was used as the standard.

There are three steps to assessing whether reliability is achieved. These steps are, employing the use of at least two coders, calculating a measure of intercoder agreement for each coding scheme used, and finally, stating both the size of the sample and rationale used to establish intercoder reliability (Geisler and Swarts, 2019; Lombard et al., 2002; Neuendorf, 2002). For this paper, one coder in addition to the researcher was requested to code one randomly selected annual report each from the South African companies' sample and the ENA companies' sample. Thus, the additional coder coded two annual reports. The additional coder was also trained and given the coding scheme to guide their coding process. The intercoder reliability was then calculated using Scott's pi formula (Scott, 1955).

In determining the reliability of the study, the researcher notes Potter and Levine-Donnerstein's (1999) assertion that using a larger group of coder's provides more credibility than a pair of coders. However, due to time constraints and limited resources, the services of one additional coder were employed. By assigning one additional person to code 10% of the sampled annual reports, the researcher was able to satisfy the minimum requirement for reliability testing (Geisler and Swarts, 2019; Lombard et al., 2002; Neuendorf, 2002).

3.6 Data Analysis Methods

The analysis of coded data requires at least two things: indices are selected and inferences are made. Krippendorff, (2004) defines an index as "a variable whose significance rests on

its correlation with other phenomena". Krippendorff (2004) goes on to list five indices commonly used in mass communication research. These include: the presence of a reference taken to indicate that the source is aware of the object that is referred to; frequency of a reference in the text taken to indicate the importance placed upon it; the number of favourable or unfavourable characteristics attributed to an object taken to indicate the attitudes of the source; the extent of the use of qualifiers taken to indicate the source's confidence or conviction; the frequency of the co-occurrence of two concepts taken to indicate the strength of their association (Krippendorff, 2004). The researcher has chosen two of these five indices and adopted them for their research.

The two indices selected are: the presence of a capability in an integrated annual report to indicate the company's knowledge of that capability and how to implement it and the frequency with which a capability is mentioned taken to indicate the importance of, emphasis on or attention given to that capability by the company. To elaborate on and demonstrate the appropriateness of these indices, the correlations upon which these indices are based must be clarified.

With the first index, the mention of a capability indicated that the executives at the company had knowledge of that capability and how to implement it. As integrated annual reports are often compiled with significant input from executives of different departments if a capability is mentioned it should indicate that at least one executive at the company has knowledge of this capability. Sentences mentioning capabilities were also only coded if, within the context of the sentence or paragraph, they appeared to already be established within the company. Therefore, the mention of a capability indicates that executives and at least a few other employees within the company have enough knowledge of a capability to establish it and make use of it as required. This correlation can be tested by interviewing employees at the company to gather information on what knowledge they have of the mentioned capabilities. The opinions of industry partners can also be an indicator of a company's capabilities. For example, if a company is awarded by their peers for service innovation, this implies that those working at the company have sufficient knowledge of the service innovation capability in order to implement it successfully. Similarly, customer feedback surveys may reveal information that indicates the extent to which a company is perceived to be customer-centric, thus indicating the knowledge employees have on what is required to implement the customer-centric configuration capability.

The second index, the frequency with which a capability is mentioned taken to indicate its importance within the company or the emphasis placed on it, must also be shown to be valid. Other correlations can be used to prove that a high frequency in the mentions of a capability indicates a high emphasis placed by the company on that capability. The company's financial statements can be studied to observe how much of the company's budget is spent on establishing or maintaining a capability. For instance, if a company allocates a significant portion of their budget to developing innovative solutions, this may be taken as an indication that the company regards innovation as an important capability. Similarly, if a significant portion of the manufacturing company's work force is employed in customer-facing roles, that might suggest that the company places emphasis on a customer-centric configuration.

Although the two indices could provide valuable insights, textual analysis could also provide further information and context for the coded text. Therefore, in addition to the

two indices the researcher also considered the contents of the coded texts for further information on the capabilities.

Once the text was coded and the indices were selected, the researcher was able to analyse the data with the assistance of QDA Miner Lite. The software provided the researcher with information on how many annual reports a particular code appeared in as well as how frequently a code appeared compared to other codes. The software also provided a total count for each code, indicating how often that code had been applied in total.

3.7 Ethical Considerations

Research can have a powerful impact on people's lives (McNeill and Chapman, 2005), this means that researchers need to give particular consideration to the ethics of their research. McNeill and Chapman (2005) outline six broad ethical rules that researchers must follow. First, researchers must ensure that participants know what the research is about and that they can refuse to participate or answer particular questions, this is referred to as informed consent. Second, researchers should not engage in deception. Third, the privacy of the participants must be safeguarded. Fourth, the identity of the research participants must be kept secret. Fifth, participants must be protected from any physical harm and finally, researchers must keep in mind legality and morality and not participate in any illegal activity. Should a researcher complete their study successfully, sharing the results with the participants would also be a fair exchange for the time and trust that was afforded to the researcher.

In order to ensure that the researcher is aware of the ethical considerations in research work, the researcher was required to review content on research ethics and pass a quiz based on that content. Before conducting the study, the researcher applied for ethical clearance as the initial intention was to interview human participants. As the research method eventually employed was the content analysis of annual reports, the ethical considerations were less complex and the ethical clearance was no longer necessary.

3.8 Conclusion

The research question and objectives are factors that have a significant influence on the research methods employed. However, these are not the only factors, as time and available resources can also have a significant impact on the choice of research methods. The content analysis of annual reports is considered by the researcher to be an appropriate research method to answer the research question and address the research's objectives within the time frame and resources available.

The sampling methods and sample size are also important considerations for a researcher. While the sample size of ten South African companies may be perceived as limited, based on the sample criteria, the sample was exhaustive and it would not have been feasible to increase the sample size considering the time and other constraints of the study.

Finally, the validity and reliability of the research is important in content analysis. The researcher took steps to establish whether their research could be considered to be valid and reliable. By employing the use of a coding scheme and an additional coder, the researcher lent some credence to the results of their study.

There are multiple aspects involved in the research method(s) a study employ. Ultimately, a researcher must select a method that will facilitate the answering of the research question in a way that is valid and reliable.

4 RESULTS AND FINDINGS

4.1 Introduction

In order to determine the level of correlation between the servitization capabilities implemented in practice and those presented in the servitization capability framework, the collected data was analysed.

Krippendorff (2004) indicates that a quantitative or a qualitative approach can be taken to content analysis and further asserts that both approaches are indispensable. Although the researcher's approach is primarily qualitative in nature, some information from the content analysis is best analysed and shared using statistical tools. The researcher thus analysed the results of the coding in Chapter 3 using both statistical and textual analysis methods.

Two samples of annual reports were analysed. The first sample was collected using the selection criteria set out in Chapter 3.3.2. This exhaustive sample included the annual reports of ten servitized South African manufacturing companies. A second sample of annual reports from ten servitized ENA manufacturing companies was also collected, using parts of the selection criteria described in Chapter 3.3.2.

During the coding of the South African sample, three additional codes under the "Other" category were ultimately added to the coding scheme in Appendix C.1. The additional codes were "adaptability", "sales" and "legal". The coding scheme was also subsequently used to code the ENA sample.

4.2 Statistical Analysis

The coded data were first analysed using statistical tools. The QDA Miner Lite software was used to produce bar graphs for code distribution and frequency. Furthermore, tools from displayr.com were employed to process the data and aid correspondence analysis.

4.2.1 Breadth of codes across companies

The first index that the researcher used during analysis was the presence of a capability in an annual report taken to indicate the company's knowledge of that capability and how to implement it. Figure 4.2.1-1 shows the presence of codes (as percentages) in the of South African sample of annual reports. The "digitalising" code was mentioned in 80% of the sampled South African annual reports, making it the most mentioned capability across the sample of South African companies. This was followed by the "HR" (human resources) and "customer-centricity" codes, both being identified in 60% of the South African sample of annual reports. The "service orientation" code made an appearance in 50% of the annual reports. The "employee engagement" and "innovating" codes were each identified in 40% of the South African sample of annual reports. The "customer knowledge", "partner relationships", "risk managing" and "adaptability" codes were identified in 30% of the South African sample of annual reports, whilst an appearance in 20% of the sample was achieved by the "custom services", "service enabler" and "RD" (research and development) codes. The least mentioned codes were the "value-based strategy", "legal" and "sales" codes, each being identified in only 10% of the South African sample of annual reports.

Unlike all of the other annual reports in the South African sample, no codes at all were applied to the Insimbi annual report.

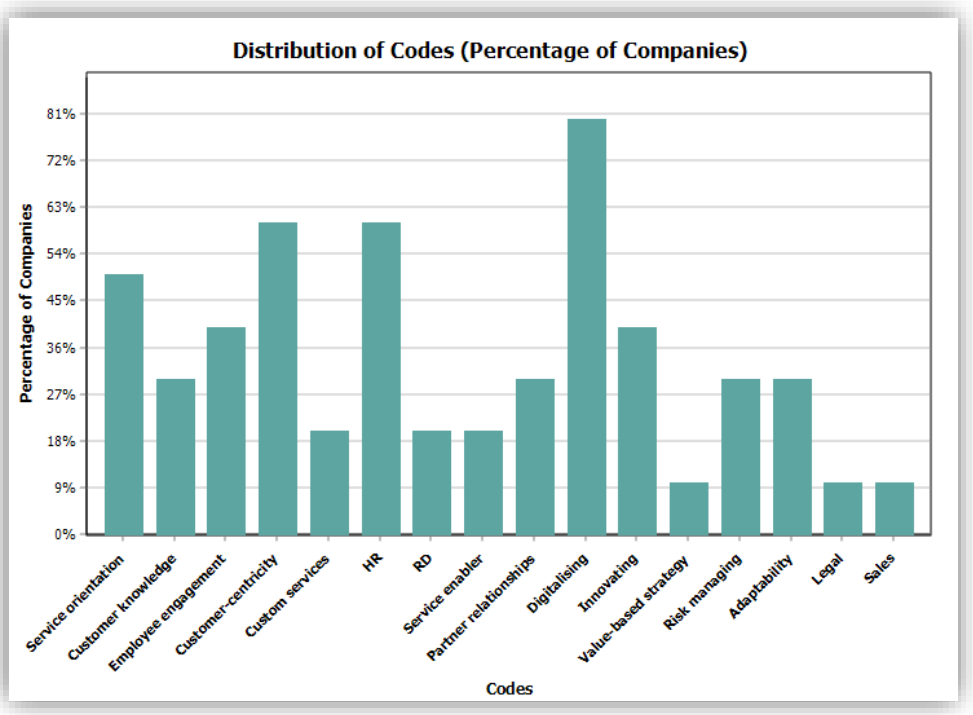


Figure 4.2.1-1: Percentage of South African company annual reports containing a particular code

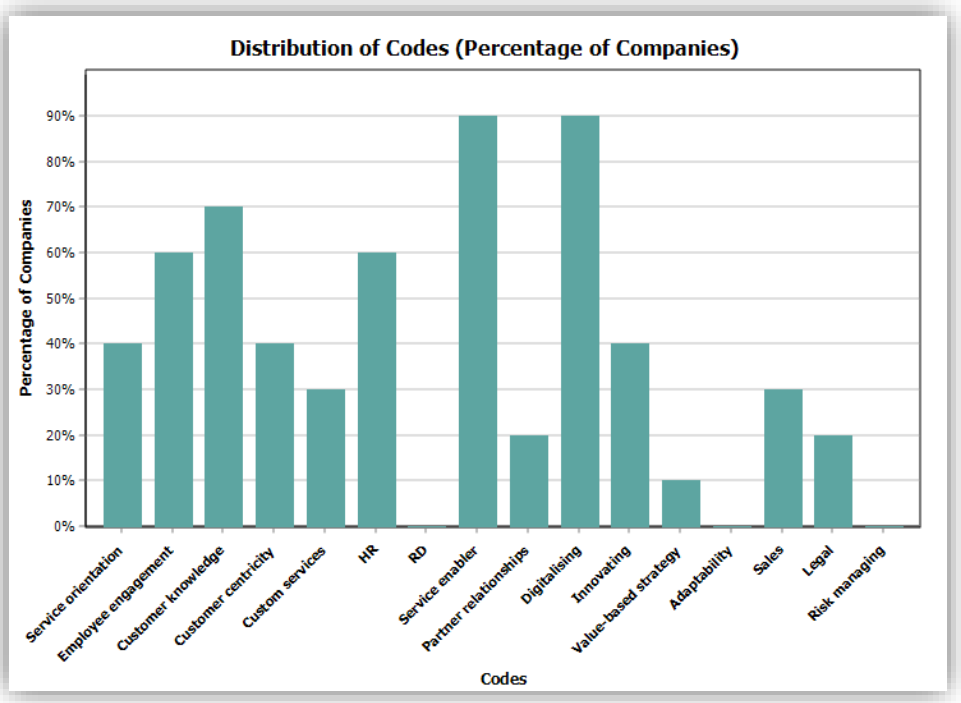


Figure 4.2.1-2: Percentage of European and North American company annual reports containing a particular code

In the ENA sample of annual reports, “Digitalising” along with “service enabler” were the most widely mentioned codes, having been mentioned in 90% of the reports. In both the South African sample and the ENA sample, “Digitalisation” was the most widely mentioned code. The “customer knowledge” code was mentioned in 70% of the ENA annual reports, whilst the “employee engagement” and “HR” codes followed, both being identified in 60% of the ENA annual reports. Codes applied in 40% of the annual reports included the “service orientation”, “customer-centricity” and “innovating” codes. 30% of the ENA annual reports were coded with the “custom services” and “sales” codes respectively, whilst in 20% of the annual reports, the “partner relationships” and “legal” codes had been identified. The “value-based strategy” code appeared in 10% of the ENA annual reports, ahead of the “risk managing”, “RD”, “adaptability” and “legal” codes which made no appearance at all.

4.2.2 Code frequency

The second index used for analysis was the frequency with which a capability was mentioned, taken to indicate the importance of, emphasis on or attention given to that capability by the sampled company.

“Digitalising” was not only the most widely mentioned capability across the annual reports, but it was also the most frequently applied code in the South African sample, making 61 appearances. “Digitalising” was followed by “innovating” which was coded eighteen times and “customer-centricity” which was coded fourteen times. Appearing twelve times each were the “customer knowledge” and “service orientation” codes. The “HR”, “partner relationships” and “employee engagement” codes were each applied nine, seven and six times respectively. The “custom services”, “RD”, “service enabler”, “value-based strategy”, “risk managing”, “adaptability”, “legal” and “sales” codes were all applied four times or less.

Unlike the South African sample of annual reports, the ENA sample does not see the frequency of one code leading far above the rest. In the ENA sample, both the “digitalisation” and the “service enabler” codes were applied 25 times, whilst the “customer knowledge” code came in third, having been applied eighteen times. The “service orientation” code was applied twelve times whilst the “employee engagement” code appeared ten times in the ENA sample. Appearing nine times each were the "customer-centricity” and “HR” codes, followed by the “custom services” code which appeared eight times and the “innovating” code which appeared six times. “Partner relationships”, “value-based strategy”, “sales” and “legal” were applied four times or less in the ENA sample. The “risk managing”, “RD” and “adaptability” codes were not applied at all in the European and North American samples of annual reports.

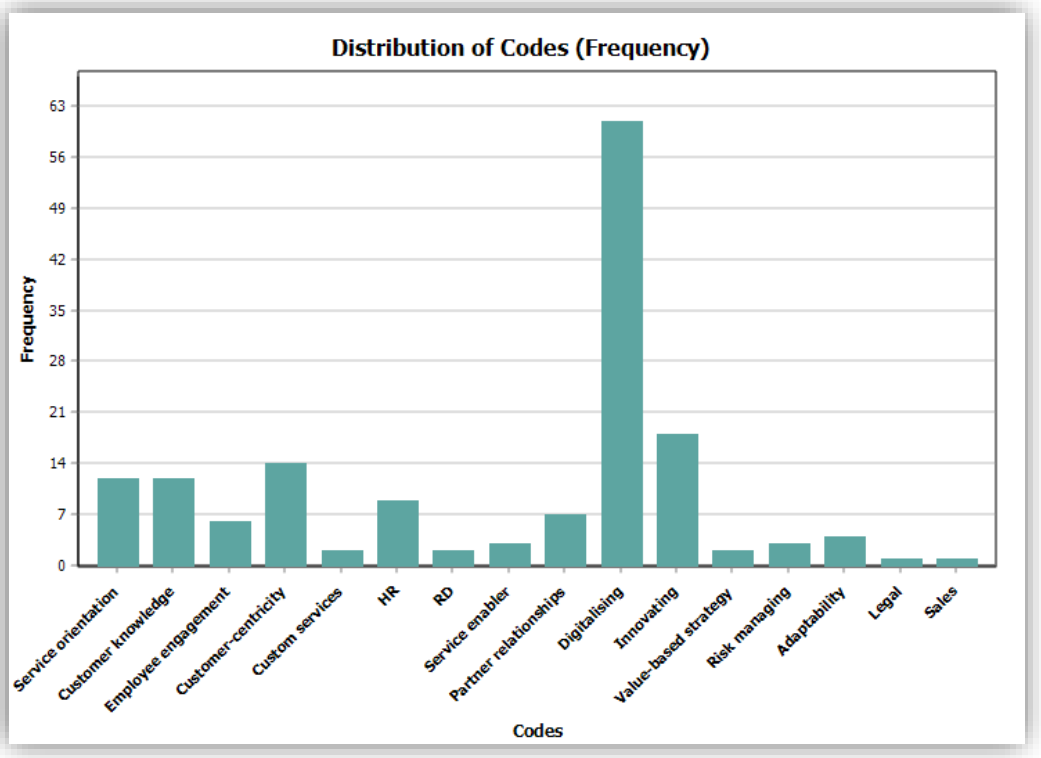


Figure 4.2.2-1:Frequency of code appearances in South African annual reports

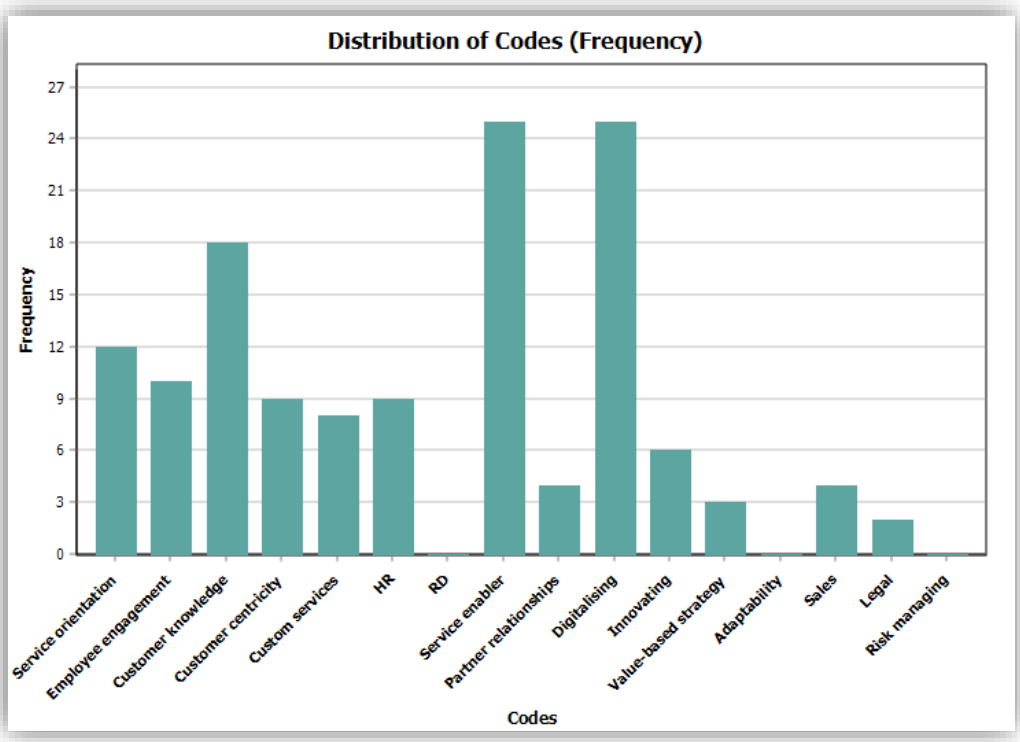


Figure 4.2.2-2: Frequency of code appearances in ENA annual reports

4.2.3 Correspondence analysis

Although the use of the two indices, mentioned in section 3.6, provides some information about the samples, other information can be gathered by comparing the capabilities and companies against each other. A correspondence analysis was performed on the South African sample, the ENA sample and on a combination of the two samples of annual reports together. The correspondence analysis unlike the previous analyses was performed using the categories or capabilities rather than the codes. For example, the service development and delivery capability consists of the "HR", "RD" and "service enabler" codes. The coding scheme provides further information on which categories or capabilities the different codes belong to (Appendix C.1).

Correspondence analysis can be presented either in the form of a scatter plot or a moonplot. A moonplot is a graphical representation of the differentiating attributes for a company or brand. The larger the font of an attribute, the more significant a differentiator it is. The closer a company is to the perimeter of the circle the stronger its association with the adjacent attributes. A correspondence analysis from a scatter plot is harder to interpret compared to a correspondence analysis from a moonplot. Despite the differences in how they are presented and interpreted, both the scatter plot and moonplot communicate the same information. The scatter plots and moonplots were produced using the information presented in Appendix D.1.

Correspondence analysis of South African sample

In a correspondence scatter plot, the closer a variable is to the origin, the smaller its significance. Figure 4.2.3-1 illustrates that the customer-centric configuration, data-gathering and exchange, service-oriented culture and digitalisation capabilities are not likely to be significant differentiators of the sampled South African companies. The smaller fonts for the same set of capabilities in figure 4.2.3-2 also reflect that these capabilities are not significant differentiators.

In addition to determining the strength of a capability as a differentiator, the scatter plot also communicates the strength of an association between a capability and a company. Figure 4.2.3-1 illustrates this principle using a set of green, purple and black lines. The strength of the association between the capability and the company is determined by the length of the line and the angle between the line leading to a variable and the line leading to a capability. The greater the length of a line and the smaller the angle, the stronger the association between the company and the variable. The pair of purple lines in figure 4.2.3-1 suggests that there is a strong association between Master Drilling and the value-based pricing and selling capability. This observation is supported in figure 4.2.3-2 where the proximity of Master Drilling to the value-based pricing and selling capability, suggests a strong association between the two.

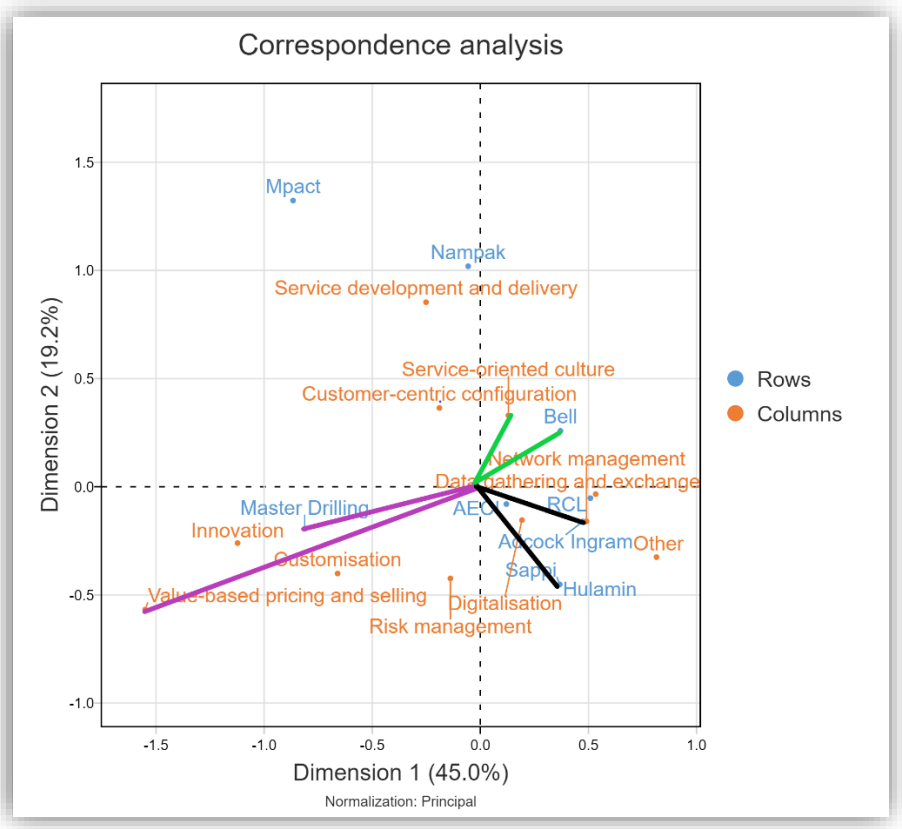


Figure 4.2.3-1: Scatter plot of the South African sample

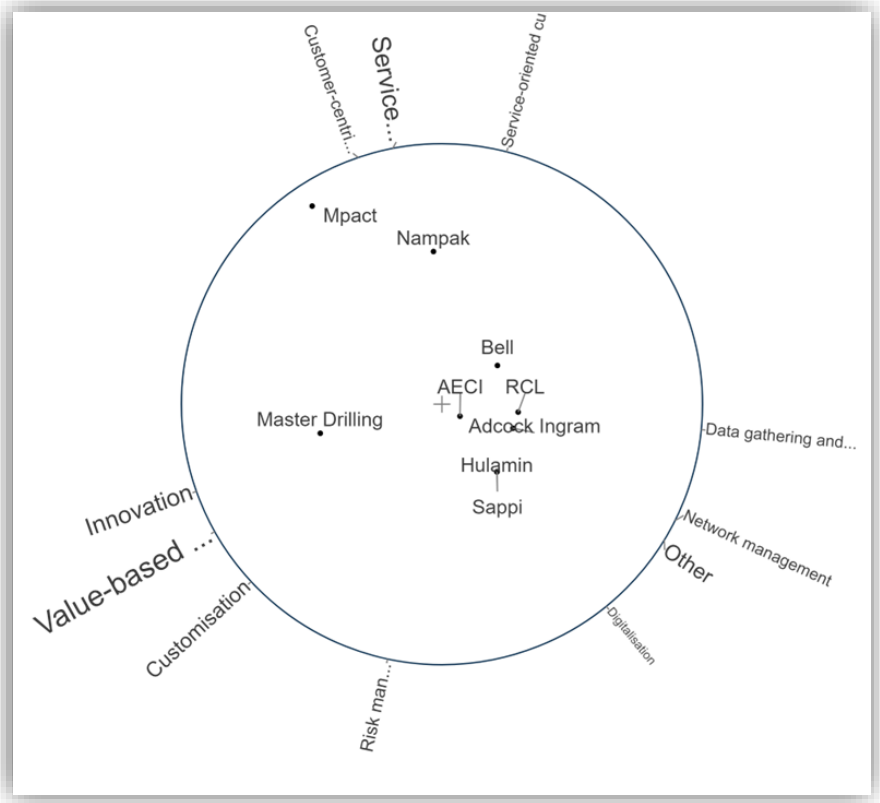


Figure 4.2.3-2:Moonplot of the South African sample

Figure 4.2.3-2 suggests that Nampak and Mpact have the strongest associations with the customer-centric configuration, service-oriented culture and service development and delivery capabilities. The majority of the companies, including Sappi, Hulamin, AECI, Adcock Ingram and RCL Foods Limited, had the strongest associations with network management, data gathering and exchange, digitalisation and "other" capabilities. These capabilities are also some of the least significant differentiators for the sampled companies.

Correspondence analysis of European and North American sample

Most of the companies in the ENA sample of annual reports appear to be more closely associated with the service-oriented culture, service development and delivery as well as "other" capabilities. However, these capabilities are not significant differentiators for the companies. This is observation is based on the small font of these capabilities in figure 4.2.3-4 and the proximity of these capabilities to the origin in figure 4.2.3-3.

The value-based pricing and selling, customisation and innovation capabilities appear to be some of the more significant differentiators for companies in both the ENA sample and the South African sample. This observation is made by comparing the font sizes for the capabilities in both figure 4.2.3-2 and figure 4.2.3-4, as well as the distance of the capabilities from the origin in both figure 4.2.3-1 and figure 4.2.3-3.

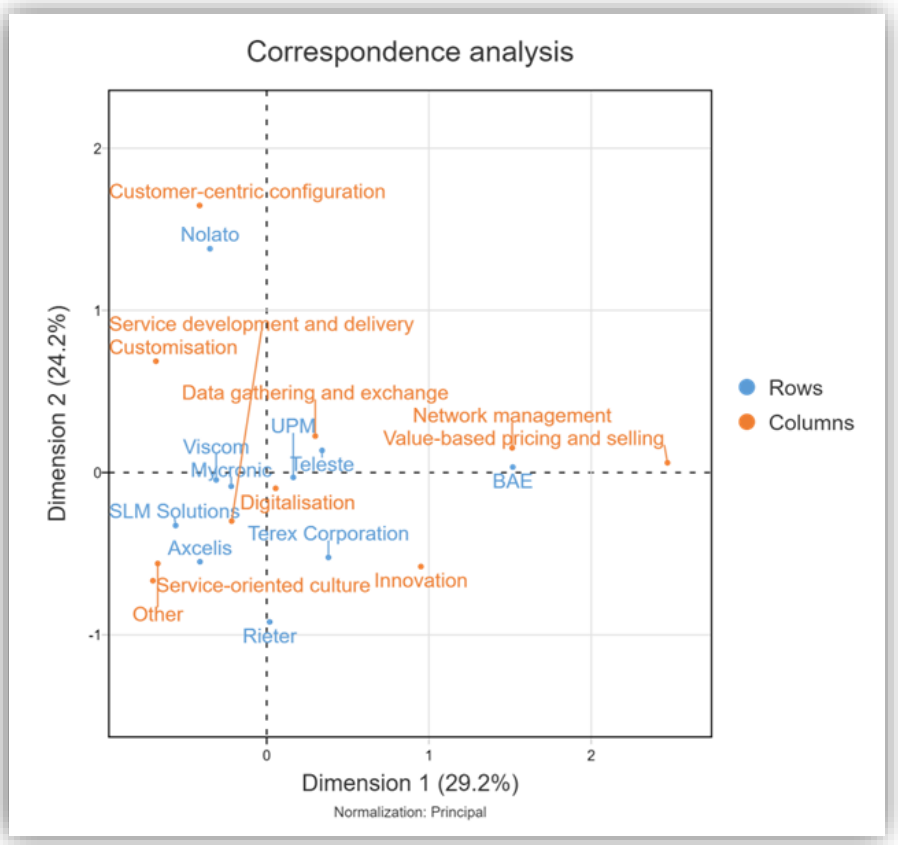


Figure 4.2.3-3: Scatter plot of ENA sample

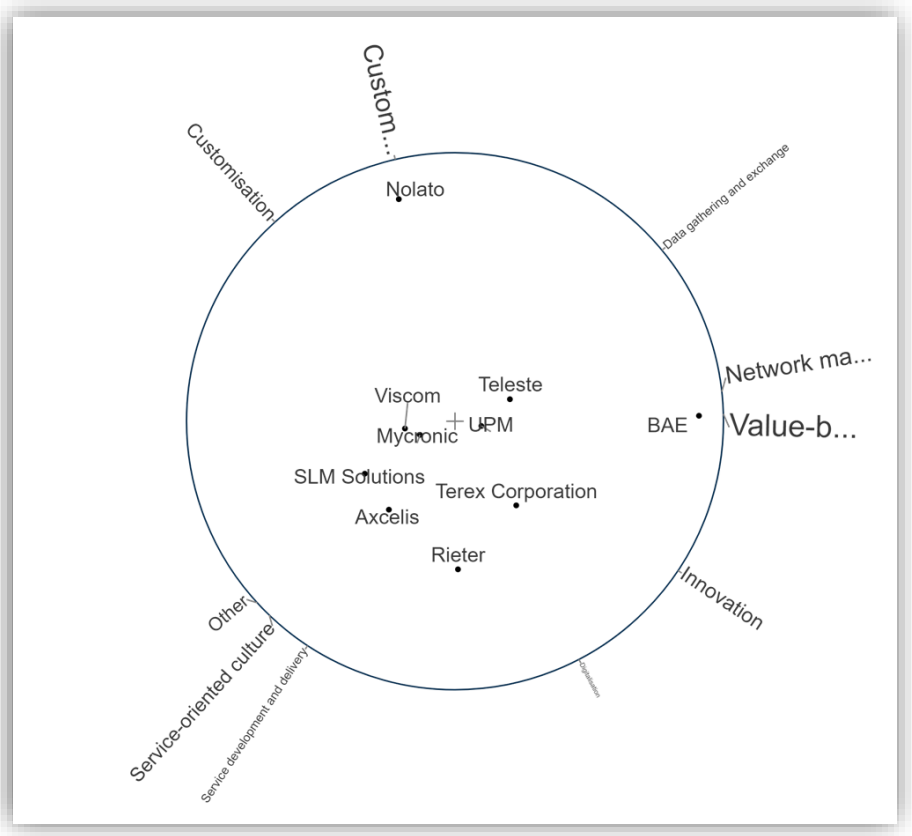


Figure 4.2.3-4: Moonplot of ENA sample

Figure 4.2.3-5 is a moonplot consisting of both South African manufacturing companies and the ENA manufacturing companies and reveals differences in the servitization capabilities that the companies emphasise. Most of the South African companies (in green) are more closely associated with data gathering and exchange, digitalisation and network management capabilities. Most of these capabilities are also displayed in smaller fonts, suggesting that they are not significant differentiators. The South African companies most closely associated to data gathering and exchange, digitalisation, network management and "other" capabilities are also companies the least associated with value-based strategy, innovation, service development and delivery, service-oriented culture, and customisation capabilities.

In contrast, the ENA companies (in red) tend to be closely associated with service development and delivery, service-oriented culture, customisation and "other" capabilities. Although these three capabilities are not the most significant differentiators, judging from the font in the moonplot and proximity to the origin in the scatter plot, greater importance is placed on them compared to the digitalisation, customer-centric configuration and data gathering and exchange capabilities. Most of the companies in the ENA sample were also least associated with digitalisation, risk management, network management, value-based pricing and selling, innovation and data gathering and exchange capabilities.

The two capabilities which are the strongest differentiators are the value-based strategy and innovation capabilities. These capabilities are also closely related to Master Drilling, Terex Corporation and BAE. Master Drilling is a South African company whilst BAE and Terex Corporation are ENA companies. The least significant differentiators were the customer-centric configuration, data gathering and exchange, digitalisation and service-oriented culture capabilities.

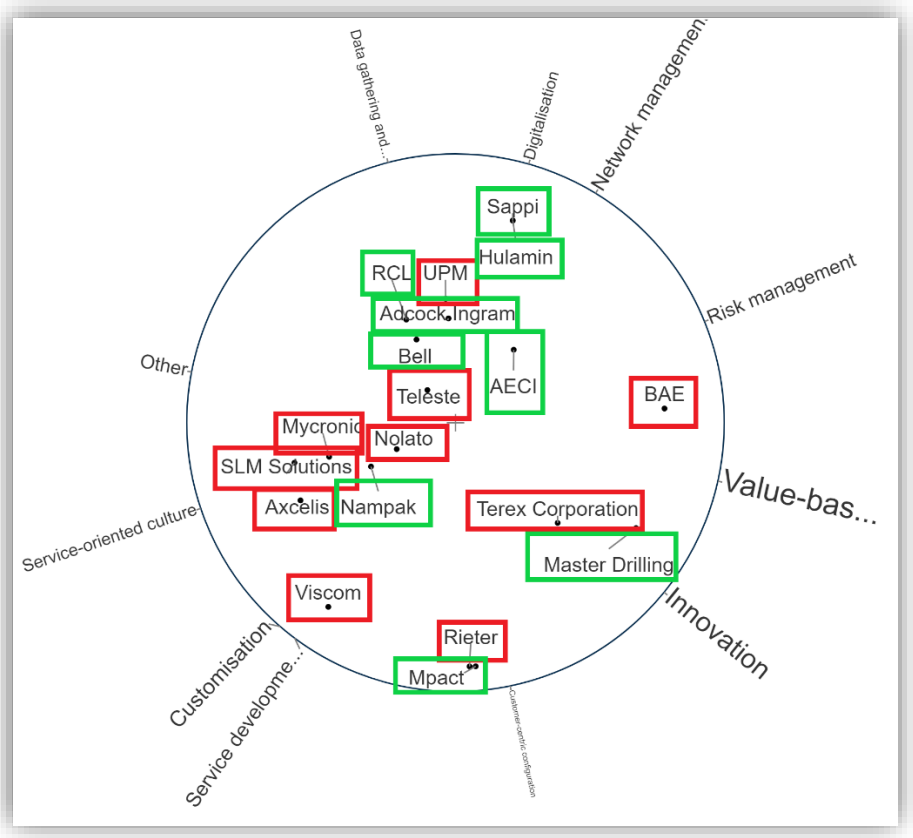


Figure 4.2.3-5: Moonplot of the South African companies in green and ENA countries in red

The statistical analysis yielded some insights into the servitization capabilities of the sampled companies. However, further information stood to be gained from the textual analysis of the sampled annual reports.

4.2.4 South African companies' textual analysis

A sample of ten annual reports by South African servitized manufacturers was coded using the coding scheme in Appendix C.1. A textual analysis of the annual reports was undertaken. The following was observed:

<u>Service-oriented culture</u>

An orientation towards services was indicated by Master Drilling who referenced an "investment" in service offerings. They referred to their mining services division stating that the division made an "investment in Applied Vehicle Analysis (AVA)

and A&R Group that focuses on proximity detection as well as mine equipment tracking" (Master Drilling, 2022). Similarly, Nampak mentioned that among their investments was an investment in "service" (Nampak, 2022). Other companies indicated that some of the services they offered were informed by the demand from the customer or a desire to add value to the customer's operations. Master Drilling (2022) indicated that they offered exploration services to "capitalise on this growing demand for geotechnical services" whilst Bell (2022) stated that: "Customer support has traditionally been one of our mainstays so when production and sales volumes dropped in 2020, we acknowledged that we have an established customer base relying on Bell support and technical backup". Adcock Ingram (2022) used phrases such as "premium service levels" and "excellent service" which were taken to suggest that the company had invested in developing service offerings of good quality.

Data gathering and exchange

The data gathering and exchange capability consisted of two codes, the "employee engagement" code and the "customer knowledge" code. Some companies such as AECI (2022) and RCL Foods Limited (2022) were found to refer to collaboration amongst employees, whilst asserting that employees were encouraged to engage amongst themselves and with management. AECI (2022) for instance stated that they "tap into AECI's intellectual capital by asking our people to suggest ideas for growing our business or reducing costs". In some instances, communication amongst employees was aided by the use of digital platforms, with RCL Foods Limited (2022) stating that they conducted "daily communication through our digital communication channels".

The other aspect of data gathering and exchange is the knowledge gathered on the customer. One company referred to gathering knowledge on how their products were used by the customer. AECI (2022) indicated that they worked "with our more than 180 crop advisers" and "we held scores of information sessions with, mostly South African, end users of our products and systems". However, other companies focused their energies on seeking to understand their customer's needs (Adcock Ingram, 2022; Bell, 2022). In other instances, companies such as Adcock Ingram focused their efforts on determining the level of customer satisfaction with their products and/or services through customer surveys.

Customer-centric configuration

In the context of this research, a company with a customer-centric configuration develops and delivers services with the customer's end goals and needs in mind. Some of the sampled companies referred to their customers as "partners" and conveyed the ways in which they had collaborated with a customer when developing or delivering a service. Nampak (2022) stated that they "are a trusted partner to our many customers", whilst Master Drilling (2022) referred to "partnerships with strategic clients to develop bespoke technology solutions". AECI (2022), Bell (2022) and Mpact, (2022) all communicated that they had a "relationship" with their customers and made mention of the ways in which the relationship was maintained such as through face-to-face interactions or the appointment of key personnel.

Customisation

The customisation capability refers to a company's ability to alter or modify a service to meet a customer's requirements. No company made mention of any modifications made to an existing service offering to satisfy the unique needs of their customer. However, AECI (2022) and Master Drilling (2022) referred to custom "solutions". In the context of the text, custom or bespoke "solutions" was taken to mean a custom combination of products and services.

Service development and delivery

Three codes were used with respect to the service development and delivery capability, these were: "HR" for human resources, "RD" for research and development and "service enabler" for any structure, process or resource that a company put in place to develop and deliver services.

In the case of human resources, companies such as Nampak (2022), AECI (2022), Adcock Ingram (2022), Bell (2022) and RCL Foods Limited (2022) referred to having employees with the technical expertise required to provide customer support and other services. Much mention was also made of providing employees with training opportunities however, the training was either related to gaining or improving manufacturing-related skills. In other instances, no details were given as to the nature of the training the company provided to employees. There were no instances recorded where a company referred to providing training to improve specifically the skills required for the provisioning of services. Neither was there any mention made of re-structuring teams or company departments to facilitate the provisioning of services.

The collected data suggests that very few companies invested in research and development for service-related activities. In one instance where research and development (R&D) was mentioned in relation to services, the company was referring to the R&D team providing technical support services. Nampak (2022) stated that "Nampak R&D continues to provide technical support to our operations and customers". In the second instance where R&D was mentioned, Adcock Ingram (2022) indicated that their R&D department participated in a WHO initiative to provide medical testing services.

Where the "service enabler" code was concerned Bell (2022) and Mpact (2022) reported that they had put structures and personnel in place so that support services were in close proximity to the customer. Another service enabler that was identified in the RCL Foods Limited (2022) annual report was the establishment of a separate service business unit. RCL Foods Limited (2022) stated that "shared functions and services have now been consolidated into a specialist business services organisation with its own director".

Network management

Some companies such as Bell (2022) and Adcock Ingram (2022), collaborated with partners to ensure that their customers received the necessary services and support. This was done either through partnering with a logistics company or a third-party

dealer. Most of the partnerships, however, were to facilitate the sharing of technical expertise and intellectual property useful for developing and delivering services. AECI (2022) for instance, indicated that a division of their business concerned with the "diversification" of their operations "comprises external experts supported by experts from our businesses".

Digitalisation

A portion of the sampled companies deployed digital platforms to process data they could use to improve their operations and make "data-driven" decisions. Digital tools were also used to manage business operations including administrative tasks and human resource processes. Specifically, Bell (2022) indicated that "continued development using the Microsoft platform enabled the digitisation of several manual processes in the group, which has contributed to increased efficiency and visibility of internal processes". The processing of information was not the only way that companies used digital platforms, some companies used digital tools to engage with customers or manage sales or customer service activities. Adcock Ingram (2022) for instance referred to the "implementation of digital and remote customer engagement technologies". In other companies, including AECI (2022) and Master Drilling (2022), digitalisation was used to enhance service offerings or facilitate the implementation of innovative solutions. Digital platforms also existed at RCL Foods Limited (2022) to facilitate communication amongst employees with the company stating that their "digital employee interfaces are playing a vital role in improving communication and connection between teams and between management and employees".

Innovation

In the SA sample, innovations related to service offerings sometimes included introducing the ability to provide services remotely. For example, Master Drilling (2022) developed remote drilling services in mines, whilst Adcock Ingram (2022) had developed remote patient monitoring services. In addition to remote services, automation also appeared in the sample, with Master Drilling (2022) developing the ability to provide automated drilling services. However, innovation was not limited to the use of automation or remote services. AECI (2022), through one of their projects, reduced the amount of thermal energy needed for dehydration by 98%, whilst in another project they introduced wireless detonation technology.

Value-based pricing and selling

No evidence was found in any of the annual reports of value-based pricing and selling for services and solutions being offered by any company. However, in two separate instances, Master Drilling (2022) indicated that their strategy involved understanding their customer's needs and creating value for them through the provision of bespoke "solutions".

Risk management

In all of the annual reports analysed, a few pages were dedicated to reporting on their risk management approach. While companies shared details of their risk

assessment and mitigation efforts, they rarely addressed service-related risks. Of the companies that did mention service-related risk management, Master Drilling (2022) opted to spread the risk of their service activities by partnering with another organisation, thus allowing them to share the financial risk and reduce their liability. Adcock Ingram (2022) utilised a "rigorous service level agreement" with a logistics service provider and close monitoring of service levels to mitigate risks associated with their service offerings. AECI (2022) opted to perform risk assessments for every potential "solution" designed at the onset so that risks could be managed from the beginning of the process and throughout.

Other

It was rare for the researcher to identify service capabilities that were not amongst the ten identified in the capability framework. There were however instances where adaptability, sales, and legal capabilities were identified. Some companies showed their ability to adapt by how they responded to the Covid-19 pandemic. As a result, of travel restrictions, AECI (2022) offered virtual consultations with clients and remotely managed blasting activities. Adcock Ingram, for example, used digital platforms to interact with customers. RCL Foods Limited (2022) referred to a service-related sales capability when they mentioned that they had a dedicated sales team that used "best in class" service methodologies. Adcock Ingram (2022) made use of contracts or "service-level agreements" to manage the provision of services.

4.2.5 European and North American companies' textual analysis

A sample of ten annual reports of servitized European and North American companies was gathered and coded using the coding scheme in Appendix C.1. The textual analysis produced the following:

Service-oriented culture

There were companies in the sample that considered services to be an important aspect of their business because customers considered their service offerings to be important to their operations. Mycronic (2022) is one of these companies and stated that "service and aftermarket support are extremely important to our customers, especially in difficult times, and account for approximately one-third of group revenue". Rieter (2022) echoed similar sentiments when they stated that "the professionalism and availability of the service is also a key aspect when customers decide to buy Rieter solutions". Another indicator of service orientation is revenue. Axcelis Technologies Inc (2022) and SLM Solutions (2022) indicated that their service offerings had contributed increasingly to the company's revenue in the previous year. SLM Solutions (2022) also indicated that service offerings had become increasingly important to their business strategy.

Data gathering and exchange

BAE Systems (2022) and Mycronic (2022) indicated that they facilitated the exchange of information by encouraging employees to share feedback and ideas within the company. UPM (2022) and Teleste (2022) went beyond encouragement,

stating that they had established "forums" to facilitate the sharing of knowledge between employees.

There were multiple companies including Axcelis Technologies Inc (2022), BAE Systems (2022), Myronic (2022), Viscom (2022), SLM Solutions (2022), UPM (2022) and Nolato (2022) that referred to their efforts to engage with the customer so that they could understand the customer's "needs", with BAE Systems (2002) indicating that "understanding our customers' needs and challenges is central to our strategy" as well as "how and where we invest in technologies and infrastructure". UPM (2022) indicated that they gathered information from the customer on the end-use of their products.

Customer-centric configuration

A common theme throughout all of the coded text for "customer-centricity" was that companies collaborated with their customers when developing or delivering services. Nolato (2022) indicated that their "extensive experience and wide-ranging expertise allow us to develop close, long-term and innovative cooperation with customers". Mycronic (2022), Viscom (2022) and Teleste (2022) highlighted that they took a collaborative approach with their customers when providing services to them.

Customisation

Multiple companies referred to activities relating to the customisation of services to suit the customer's needs. Specifically, SLM Solutions (2022) indicated that they adopted service level agreements to facilitating the customising of services whilst Nolato (2022) stated that custom services were possible because of a decentralised business model. Viscom (2022) pointed to long-term customer contacts as the basis for their "comprehensive and customised service".

Service development and delivery

Human resources, in the form of engineers, "experts" and other employees with sales or technical expertise, were cited by Axcelis Technologies Inc (2022), BAE Systems (2022), SLM Solutions (2022), Teleste (2022) and Viscom (2022) as being essential to providing customers with technical support services. No other human resource structures or processes were mentioned as being helpful in facilitating the development and delivery of services.

No instances were found for service-related research and development activities. Proximity to the customer was mentioned by Myrconic (2022), SLM Solutions (2022), Teleste (2022), Viscom (2022), Terex Corporation (2022) and Nolato (2022) as an important factor that assisted in facilitating the delivery of support services. A further enabler of services was cited to be the implementation of technology. Axcelis (2022) deployed a web-based parts management program whilst Mycronic (2022) used "augmented reality" glasses to perform remote services and maintenance. In another instance, Teleste (2022) was able to remotely perform the final tuning of their products after installation. UPM (2022) stated that they had "continued building a team of international experts with a strong chemical

industry background to further advance our research and development, build strong commercial operations, and then establish the service and supply infrastructure to meet our customers' specific needs". Rieter (2022) referred to implementing service infrastructure but did not elaborate on what that entailed. UPM (2022) made mention of their after-sales group producing spare parts that could be used to service customers. Physical facilities such as training centres or service hubs also played a role in enabling services within some companies.

Network management

BAE Systems (2022) and Teleste (2022) were the only two companies in the ENA sample that made mention of the network management capability. In every instance, the network management capability involved the collaboration of the companies with their partners to gain technical expertise for the development or delivery of services. Teleste (2022) for instance mentioned that "the innovative ecosystem provided an excellent opportunity to collaborate in developing new digital infrastructure and services".

Digitalisation

A portion of the sampled companies including Axcelis Technologies Inc (2022) and Viscom (2022) utilised software and web-based programs to manage inventory and plan operations, whilst BAE Systems (2022), SLM Solutions (2022), Teleste (2022), Terex Corporation (2022) and Nolato (2022) used digital tools for data analysis and to facilitate data-driven decision making. Digital tools were also utilised by UPM (2022) and Teleste (2022) to communicate with customers, collect information that may be useful to the customer or simplify interactions with the customer.

Innovation

Rieter (2022) and Terex Corporation (2022) cited their partnership with their customers as a driving force and enabler of innovation for them. However, service innovation was often mentioned together with product innovation and very rarely mentioned on its own. BAE Systems (2022) highlighted the importance of innovation stating that "technology and innovation underpin our strategy and the development of products and services".

Value-based pricing and selling

Only one company, BAE Systems (2022) mentioned (in more than one instance) that their strategy involved creating value for their customer. However, they did not make any mention of value-based pricing or selling.

Risk management

No instances were found in the ENA sample for the risk management of service-related activities.

Other

No capabilities were found in the ENA sample that referred to the companies' ability to adapt their service offerings. However, the "legal" code was applied in the Mycronic (2022) and SLM Solutions (2022) annual reports and in both instances the coded sentences referred to the service agreements that the companies had put in place with their customers. The "sales" code was also applied in the annual reports prepared by Axcelis (2022), SLM Solutions (2022) and Viscom (2022), with particular references being made to employees or teams designated specifically for sales purposes. Axcelis (2022) indicated that they had sales offices in multiple countries.

4.3 Reliability Results

Although measures were already put in place to ensure validity, mainly through the coding scheme, reliability still needs to be proven. To ensure the reliability of the results, the researcher appointed and trained one additional coder. The coder was trained on how to use the coding scheme in Appendix C.1 and was allowed to practice coding on a few annual reports before commencing with their actual coding. Lombard et al. (2002) indicated that a reliability sample could not be less than 10% of the full sample. Due to time constraints, the researcher chose a reliability sample consisting of one randomly selected annual report from the South African sample and one annual report from the European and North American samples.

Scott's pi was used to determine the reliability of the study. The equation for Scott's pi is shown below:

$$pi = \frac{(P_o - P_e)}{(1 - P_e)}$$

Where Po is the observed percentage of agreement and Pe is the percentage of agreement expected by chance.

Scott's pi is commonly thought to be overly conservative. To mitigate this, Potter and Levine-Donnerstein (1999) suggest calculating Pe using the formula below, thus potentially avoiding the pitfalls of the typically overly conservative Scott's pi.

$$P_e = \frac{1}{K^{N-1}}$$

K is the number of coding options and N is the number of coders. With a K of sixteen and N of two, the researcher found their Pe to be 0.0625.

The researcher's coding was used as the standard to compare the results from the additional coder. The results from the first annual report which was selected from the South African sample showed that the coder agreed with the researcher in 31 of the 36 instances of coded text. This produced a Scott's pi of 0.88. In the second annual report, which was selected from the ENA sample, the coder agreed on ten out of the twelve instances of code identified by the researcher. The Scott's pi was thus found to be 0.82.

Although there are no established standards for intercoder reliability, Neuendorf (2002) suggest that "coefficients of .90 or greater would be acceptable to all, .80 or greater would be acceptable in most situations, and below that, there exists great disagreement".

4.4 Conclusion

When analysing the data, the researcher had to ensure that the methods of analysis would help them to answer the research question and satisfy their objectives. The two indices selected by the researcher contributed significantly towards answering the research question and meeting the researcher's objectives for this study. By analysing the distribution of the capabilities across the annual report samples, the researcher was able to observe the capabilities that were referenced most widely. The researcher was also able to observe which capabilities were referenced most frequently. However, this insight was limited and needed to be supplemented. Textual analysis was used to collect additional information that not only supported the results associated with the two indices but also provided some background and context for these results. The researcher thus believes that the research method, along with the analysis method was suitable for answering the research question and satisfying the researcher's objectives.

Although the validity of the research was addressed in Chapter Three, reliability was paid particular attention in Chapter Four. Even though more coders would have been ideal, the use of a single additional coder for this study met the minimum requirement to assure the reliability of the research results. Although Scott's pi for both the South African sample and ENA sample were found to be below 0.9, they were greater than 0.8, a result that is considered acceptable in most situations.

5 DISCUSSION

5.1 Introduction

Thus far, the manner in which data was collected and analysed in order to answer the research question has been shared. The research question required that the extent of the servitization capabilities present in the sampled South African manufacturing companies be determined. Furthermore, the researcher sought to determine whether or not differences existed between the servitization capabilities referenced in the South African sample of annual reports versus the ENA sample. The results of the study presented in Chapter Four are interpreted and the implications are determined in this chapter.

5.2 Key Findings

Within the South African sample of annual reports, all of the ten capabilities presented in the capability framework of Chapter Two were identified. Although all the servitization capabilities appeared in at least one South African annual report, one South African company, despite offering services, did not report having implemented any of the servitization capabilities.

Within the ENA sample of annual reports, the "risk managing" code was not applied to any of the reports. Unlike the South African sample though, every company in the ENA sample reported having at least one of the capabilities identified in the capability framework of Chapter Two.

The results further indicated that similarities existed between the South African sample and the ENA sample. Despite the similarities however, the companies within the South African sample tended to be closely associated with different capabilities when compared to the ENA sample. The South African companies were more closely associated with data gathering and exchange, digitalisation and network management capabilities, whilst the ENA companies tended to be closely associated with service development and delivery, service-oriented culture, and customisation capabilities. Furthermore, within each sample, there was variance amongst the companies regarding which servitization capabilities they reported and the frequency by which these capabilities were mentioned.

5.3 Interpretation of Results

The researcher collected ten annual reports of South African-based companies and ten annual reports of ENA-based companies. The most frequently and widely mentioned capabilities in both samples was the digitalisation capability. While it was mentioned in 80% of the South African annual reports and 90% of the ENA annual reports the frequency of the codes differed more significantly. The "digitalisation" code was applied 61 times in the South African sample and 25 times in the ENA sample. These results imply that even though most companies in both the South African and ENA samples referred to the digitalisation capability, South African companies placed a greater emphasis on this capability compared to the ENA companies. This emphasis on digitalisation may be because the sampled South African companies considered digitalisation to be important, to a greater extent than the ENA companies did. Although not much literature on servitization in South Africa is available, an article by Giovannini, (2019) not only asserted that South African companies needed to begin offering "advanced" services, but also that the Internet

of Things, cloud computing and big data played a central role in the development of advanced services. This may be an attitude that is held by others within the South African business community. Additionally, Weeks and Benade (2015) through their case study of a servitized South African company, found that ICT support systems played an important role in the company's servitization strategy. Another possible reason for the differences in the "digitalisation" code frequency between the two samples could be that the sampled ENA companies had already established much of their digitalisation requirements and therefore no longer emphasised digitalisation in their annual reports. However, an emphasis on digitalisation is not likely to be a significant differentiator for the companies as evidenced by scatter plots and moonplots presented in Chapter 4. Therefore, digitalisation alone is not likely to give a company's services an edge over its competitors.

Although digitalisation may not be a significant differentiator for a company, the literature suggests that it is an important capability for a servitized company. Kanninen et al. (2017) found that IT tools support servitization, whilst Baines et al. (2020) claim that the progression of servitization is significantly affected by the availability and access to digital technologies. However, digitalisation was one of the few codes whose definition did not require that the capability be mentioned within the context of providing services. This was due to the fact that while the literature does suggest that digital tools are required to aid servitization, does not require that these digital tools be solely established or utilised for the provision of services. As such the "digitalisation" code was applied wherever the digitalisation capability was mentioned. This means that even companies with little to no servitization activities can have significant digitalisation capabilities. Therefore, the digitalisation capability cannot be used as a measure of the extent to which a company is servitized.

The service orientation of a company was a slightly tricky capability to identify directly because it relates to the attitudes and mindsets of the employees, something that is not often reported on in great detail in annual reports. Benade and Weeks (2010) state that "a change in culture and particular management mindsets, thinking or paradigms" was required when implementing servitization. Information on the mindsets of employees could not be obtained through annual reports. Therefore, indications of service orientation such as how services were being described (for example as "high quality" or "excellent) or the percentage of a company's revenue that services accounted for (a measure of the importance placed on services) were considered instead. Similar results for the service orientation capability were noted across the South African sample and the ENA sample. 50% of annual reports in the South African sample and 40% of the annual reports in the ENA sample were coded with the "service orientation" code. In both the South African sample and the ENA sample, the "service orientation" code was applied twelve times. Appendix B.1 shows that most companies in both the South African sample and the ENA sample offered product-centric services such as maintenance, repairs and "technical support" services. Companies tended to provide services as "add-ons" for their products, an indication that services were seen as a way to enhance their product offerings, thus implying that the companies were more product-oriented. This may be the reason for most companies not making many references that suggested a service orientation. Interestingly, some of the literature suggests that a service culture is associated with advanced services and not product-centric services, with Story et al. (2017) stating that one of the capabilities for advanced services is evolving from a product-centric organisation towards a services culture. This contradicts the capability framework of Chapter Two which suggests that a service-oriented culture should be one of the first capabilities that a servitizing company

implements. Still, other researchers such as Weeks and Benade (2015) suggest that a service-oriented culture is an essential component of any servitization strategy. The moonplots in Chapter 4 however suggest that a service-oriented culture is not a significant differentiator for a company.

With the majority of the companies offering product-centric services as opposed to advanced services, it might be expected that the capabilities associated with advanced services would be scarce within the sampled annual reports. The literature suggests that advanced services may require additional capabilities to product-centric services. Baines and Lightfoot (2014) and Sjödin et al. (2016) for instance produced papers on servitization capabilities specifically for advanced services. The low number of instances where the "value-based strategy" code was applied, twice in the sample of South African annual reports and thrice in the sample of ENA annual reports, implies that perhaps product-centric services don't require the value-based pricing and selling capability. Product-centric services such as repairs and maintenance may be viewed by the customer as necessary "add-ons" for products. The perceived value of product-centric services is inextricable from the products themselves, thus customers are essentially paying to ensure that they have a working product. With advanced services, customers are paying for a solution to their problems, a scenario that would allow for value-based pricing and selling to be implemented because the selling price is not necessarily tied to the value of the product but to the perceived value of the solution.

The "risk managing" code did not fare better than the value-based pricing and selling capability, having been applied one time each in three annual reports from the South African sample, and not at all in the ENA sample of annual reports. While the risk management capability was mentioned extensively in most of the sampled annual reports, it was very rarely mentioned in relation to the management of service-related risk. Based on the perspective presented by Baines and Shi (2015), it is believed that the reason for this gap is that unlike with advanced services, the provision of product-centric services may not be associated with significant risk as the service provider does not assume responsibility for ensuring the availability of the asset, its condition and performance.

The customisation capability, also associated with advanced services, was not referred to frequently in either sample of annual reports. The "custom services" code, which belongs to the customisation capability was applied in only 20% of the annual reports in the South African sample and 30% of the annual reports in the ENA sample. Based on Lütjen et al. (2017), the reason for this is thought to be that product-centric services tend to not be as complex to develop and deliver as advanced services, and there may not be many opportunities for customisation. Considering that most of the companies in both samples offered product-centric services, it is unsurprising that there were not many instances where customisation of services was mentioned.

The fourth and final capability associated with the service expansion stage is the innovation capability. The innovating code was applied in 40% of the South African sample of annual reports and 40% of the ENA sample of annual reports. The innovating code also appeared eighteen times in the South African sample and six times in the ENA sample of annual reports. Of the eighteen appearances made by the innovating code in the South African sample, thirteen of them were made in the Master Drilling annual report. Based on this we can infer that although some of the sampled companies were invested in developing and delivering innovative services, they were slower in establishing the risk management and

value-based pricing and selling capabilities that could support this move. This may be because companies are not fully aware of the risks associated with the service innovations they introduce, nor are they well versed in how to implement value-based pricing and selling for the innovations they introduce.

The network management capability was another capability that had limited reports in the annual reports analysed. Not many companies appeared to fully leverage their network of partners to gain access to additional service capabilities. Only 30% of annual reports from the South African sample and 20% of annual reports from the ENA sample were coded with the "partner relationships" code which belongs to the network management capability. In most instances where the "partner relationships" code was applied, it was for a sentence that referred to the respective company partnering with another organization for the design of new and often innovative service technology. However, these instances did not compare to the number of instances where companies collaborated with other organisations for the purposes of product design. Companies tended to report significantly more instances of collaboration with their partners for product-related purposes. This indicates that the lower rate of partner collaboration for service-related activity is not due to companies failing to appreciate the benefits of partnering with other organisations. Furthermore, Weeks and Benade (2015) reported that their respondents had partnered with a network of "small independent installation and maintenance service providers" as part of their servitization strategy. Similar results were found in the literature, suggesting that a company's network does indeed play an important role in servitization (Baines et al., 2020; Helm and Graf, 2018; Jovanovic et al., 2019; Sjödin et al., 2016). Therefore, it was not expected that the reports of network capability to be as low as they were in both samples. Some references to the network management capability were however made. In the ENA sample, BAE Systems and Teleste indicated that they relied on their partners for their intellectual property or expertise. Similar sentiments were also identified in the South African sample of annual reports where AECI and Adcock Ingram indicated that they had partnered with organisations who, amongst other things, had wireless detonation or medical diagnostic capabilities. Furthermore, in the South African sample of annual reports the "partner relationships" code was applied to sentences that referred to collaboration to support logistical needs. Bell and Adcock Ingram indicated that some of their logistical operations were delegated to a third party.

When delivering their services, some of the companies referred to partnering with "dealers" in other countries or with logistic companies in order to ensure that customers received the services they required. This may be more critical for companies with global operations. Both the South African and ENA sample of annual reports only contained companies that were listed on a stock exchange and most of those companies had operations outside of the country where they were listed. This reliance on partners for logistical operations was not typically observed in the existing literature. This may be because most research on servitization capabilities was not completed using samples where the companies were included based on their listing on a stock exchange. The companies sampled in a significant portion of the existing literature may have had operations primarily in one country or region, thus reducing the likelihood that they would need to partner with organisations that offer logistic services.

Where the service development and delivery capability are concerned, some codes fared better than others. The service development and delivery capability is comprised of the "HR", "RD" and "service enabler" codes. The "HR" code appears nine times each in both

the South African sample and the ENA sample of annual reports. In both samples, the "HR" code was applied in 60% of the annual reports. In every instance, the "HR" code, which refers to human resources, was applied to mention the technical expertise and skilled personnel the company employed to either develop or deliver services. The role of skilled personnel in servitization is supported in the literature by (Story et al., 2017). Although companies often made mention of training their employees, no mention was made within either sample, of providing employees with training specifically so they could develop or deliver services. The literature does not frequently refer to the training of employees for the provision of services, however certain papers do highlight its importance (Jovanovic et al., 2019; Ulaga and Reinartz, 2011; Weeks and Benade, 2015). It would appear that although some papers do refer to training employees to provide services, it is not emphasised just as it has not been emphasised in both the South African and ENA samples.

The "service enabler" code on the other hand was most often applied to sentences referring to the proximity of service personnel to the customer. The "service enabler" code encompasses any resource, process or organisational structure that aids in the development and delivery of services. It would thus appear that in order for a company to establish a service development and delivery capability they must invest in ensuring that they have personnel with the required technical expertise in close proximity to the customer. This finding is supported by Homburg et al. (2003) and Baines and Lightfoot (2014) whom both refer to the importance of human resources in the provision of services. However, they do not make particular mention of proximity to the customer as a facilitator of service delivery. The size of a company's operations may have something to do with whether or not proximity to a customer will be given particular consideration. The South African sample and ENA sample both consisted of annual reports produced by companies listed on a stock exchange. These companies often had operations in other countries and sometimes on other continents. Based on the literature review conducted, most of the studies on servitization did not include or exclude companies from their samples based on whether or not they were listed on a stock exchange. This means smaller companies with only local operations could have been included in samples for many of the servitization capability studies. Smaller companies with only local operations are unlikely to consider their proximity to their customers if their customers are local and already in close proximity. The other service enabler mentioned was the establishment of a separate business unit for services. RCL Foods Limited (2022) referred specifically to consolidating all of their service activity into a separate business unit. The need for a separate business unit is supported by (Weeks and Benade, 2009) who state that "services are so different in nature from products and the processes involved are so multi-faceted and multi-disciplinary in nature that the establishment of a separate services unit is without doubt deemed to be essential as part of the servitization process". Oliva and Kallenberg (2003) produced similar findings, suggesting that the establishment of a separate service business unit could be one of the initial servitization steps.

The final code belonging to the service development and delivery capability was the "RD" code. This code was rarely applied in the South African sample and was not applied at all in the ENA sample. Companies often referred to the research and development of their products, however, the same emphasis was rarely placed on research and development for their service offering. This may be a further indicator that most of the companies remained product-centric and only saw services as a way to enhance their product offerings. As such, the companies did not place much focus on research and development for their service offerings.

The data gathering and exchange capability appeared to be more significant within the ENA sample of annual reports compared to the South African sample. The "customer knowledge" and "employee engagement" codes, both belonging to the data gathering and exchange capability, were applied in 70% and 60% of the ENA annual reports respectively. However, in the South African sample, the "customer knowledge code" and "employee engagement" codes were applied in 30% and 40% of the annual reports respectively. This is a significant difference and the reason for the difference is unclear. Different corporate cultural norms may exist within South African companies compared to the ENA companies. These differences may account for how employees within a company engage with each other and with the customer. Interestingly, the data gathering and exchange capability were not proven to be positively correlated with a customer-centric configuration. It was expected that companies that referred to gathering knowledge on the customer's needs and operations would also refer to collaborating with the customer and developing services with the customer's needs in mind. However, this does not appear to be the case. In the ENA sample of annual reports, 70% of the annual reports were coded with the "customer knowledge" code, however, the "customer-centricity" code was only applied in 40% of the annual reports. In the South African sample of annual reports, the numbers were reversed with the "customer knowledge" code being applied in 30% of the annual reports, whilst the "customer-centricity" code was applied in 70% of the annual reports. There appears to be a negative correlation between the data gathering and exchange capability and the customer-centric configuration capability. The data suggest that the sampled companies weren't necessarily using their customer knowledge to cultivate a customer-centric configuration.

For the "other" category of capabilities, the "sales" and "legal" codes were applied to both the South African sample and the ENA sample of annual reports. However, the "adaptability" code was applied only in the South African sample of annual reports, with 30% of the annual reports being coded. In all instances, the "adaptability" code was applied to sentences where digital technologies were used to alleviate challenges brought by Covid-19 travel restrictions and the inability to meet customers in person. The results suggest that the South African sample of companies were more responsive and decisive in the way they responded to Covid-19-related challenges. Another possibility is that similar digitalisation capabilities to those established by the South African sample of companies in response to Covid-19 had already been established at the sampled ENA companies.

The next code belonging to the "other" capability category was the "sales" code. The "sales" code was applied to 10% of the South African sample of annual reports and 30% of the annual reports in the ENA sample. The sentences coded as "sales" in both samples all referred to service sales personnel or in the case of Axcelis, the existence of "sales offices" in multiple countries. Although a "sales" capability was not initially included in the capability framework, the references to service sales capabilities prompted a review of the servitization capability research again to find mentions of the service sales capability. Based on the literature review conducted, only a few papers refer to the service sales capability, e.g., Kanninen et al., 2017; Sjödin et al., 2016; Storbacka, 2011.

The "legal" code was the final code belonging to the "other" capability. It appeared in 10% of the South African sample of annual reports and 20% of the ENA sample. In all of the instances, the coded sentences referred to the use of service agreements between the manufacturing companies and their customers. Other instances where the companies

referred to legal documents or activities to aid service provision were not identified. Although the literature does not frequently refer to legal capabilities for servitization, Weeks and Benade (2015) do identify legal capability as being important in a servitization strategy. It is possible that some of the companies in both samples consider service agreements to be sufficient legal protection as the product-centric services they offer do not lend themselves to complex processes that require complex legal structures. It is also possible that with advanced services, especially as the company assumes more risk, that the company would deem it necessary to employ more intricate legal strategies to protect its interests.

5.4 Study Implications

The results from the coded annual reports suggest that differences exist between the servitization capabilities implemented in the sample of South African companies and the sample of ENA companies. There also appears to be a difference in the extent to which certain capabilities are mentioned within the sampled annual reports.

Based on the literature review conducted there does not appear to be existing literature that examines whether or not there are differences in the servitization capabilities present in companies across different countries or regions. There also doesn't appear to be much literature that attempts to determine which servitization capabilities companies should place an emphasis on.

The results of this study suggest that the servitization capabilities implemented by companies may be influenced by where in the world they operate. Although some similarities exist, the differences observed between the ENA sample and the South African sample of annual reports suggest that the region where a company is based may influence which capabilities they implement or place an emphasis on. It is also possible that a lag exists between regions so that it is not that differences exist between which capabilities are implemented and emphasised but rather that certain regions implement, emphasise and report on certain capabilities at different points in time. This may be because of differences in demand for products and services or perhaps the differences in socio-economic conditions across the different regions.

The results of this study also suggest that the stage of a company's servitization journey plays a role in what capabilities a company will emphasise. Most of the sampled annual reports in both the South African sample and the ENA sample primarily offered product-centric services. It was also found that fewer companies in both samples referred to the innovation, value-based pricing and selling and risk management capabilities; all these are capabilities that are associated with the "service expansion" stage or advanced services. Therefore, it would appear that it is necessary to study servitization capabilities according to whether the area of interest is product-centric services or advanced services.

A significant portion of the research on servitization capabilities is concerned with determining which capabilities companies require to transition from manufacturing products to offering a combination of products and services. Some of the research focuses on the capabilities required to facilitate the offering of advanced services. However, there doesn't appear to be much research available that has investigated the servitization capabilities companies require to differentiate themselves from their competitors. Value-based pricing and selling, innovation, customisation and network management are the

servitization capabilities identified as possible differentiators for companies. It may be useful for companies to have information not only on which servitization capabilities are a requirement but also on which servitization capabilities could provide a competitive advantage.

Based on the research conducted on servitization capabilities, consideration must also be given to one company in the South African sample of annual reports, Insimbi, which did not refer to any servitization capabilities at all, even though they offered services. Furthermore, three companies each from the South African sample and the ENA sample, reported on only three or fewer capabilities in their annual reports. This suggests that some of the sampled companies had either implemented less than half of the servitization capabilities that were included in the capability framework or had simply not reported on all of the servitization capabilities they had implemented. This raises the question of whether or not all of the servitization capabilities mentioned in the literature are indeed necessary for servitization.

5.5 Conclusion

This study, unlike most studies on servitization, did not make use of the case study, interview or survey research methods and tools. By sampling annual reports and employing content analysis as the research method, the researcher was able to gain insights into the servitization capabilities the sampled manufacturing companies established. These insights provide an additional perspective that may not be apparent when using other research methods.

The findings of this study suggest that there is some correlation between servitization literature and the implementation of servitization capabilities in practice. There however appears to be variability amongst the companies regarding the extent of the correlation as some seemed to have implemented more servitization capabilities than others. ENA countries also appeared to emphasise a different set of capabilities compared to those emphasised by South African companies. The data however indicates that the existing servitization theory, although produced primarily with data from ENA countries, is applicable within the South African context.

6 CONCLUSION

6.1 Introduction

This study provides insights into the servitization capabilities implemented at South African companies. The data collected for this study suggest that there is a correlation between servitization literature and the servitization capabilities that are implemented in practice. It also appears to be the case that differences exist between South Africa and ENA countries regarding the servitization capabilities they choose to emphasise. These findings however serve as a pre-cursor for other researchers as they cannot be generalised and are subject to limitations. Recommendations are made for further research.

6.2 Study Limitations

A sample of annual reports were collected using the inclusion criteria described in section 3.3.2. Only ten annual reports from companies listed on the JSE were included in the South African sample, however, despite the limited size, the sample was exhaustive. Ten annual reports were also collected as part of the ENA sample. The sample size of ten annual reports limits the extent to which the results of this study can be generalised. However, the research question and objectives were not intended to direct the study towards results that could be generalised, but rather towards gathering insights into which servitization capabilities the sampled companies implemented and the extent of these capabilities. The objective was also to determine whether or not differences existed between servitization capabilities in the South African sample and the ENA sample.

Time was another constraint for this study which limited the analysis to only the most recent annual reports. This means data from the previous years' annual reports of the sampled companies were not collected. As a result, how a company's servitization capabilities evolved over the years was not assessed. Additionally, due to limited resources only one additional coder was employed. A larger team of coders would have allowed for the analysis of annual reports from multiple years.

6.3 Recommendations

This study was not undertaken to produce results that could be generalised to the greater population of companies, instead the findings of this research can be used as a basis for further research. As such, the researcher will not be making recommendations for the general population of manufacturing companies.

In order to gain further insights into this study's findings and produce results that can be generalised, further research is required. As such, it is recommended that this study be replicated with a larger sample size which also includes annual reports from the previous five years. It is further recommended that the scope of the study be expanded to include companies from the Southern African Development Community (SADC) region. The results from a study with a larger sample size can then be generalised and a determination made on whether or not servitization capabilities differ across regions.

Further research is also required to determine whether companies with global operations require a different set of capabilities or additional capabilities. As the samples for this study consisted of companies listed on a stock exchange, many of them had global operations. A

comparison between the servitization capability requirements of companies with global operations versus those with only local operations may provide additional insights into which capabilities manufacturing companies should emphasise depending on the extent of their operations. It was also expressed by some researchers that the country of origin may have affected the results they observed, as such it is recommended that the impact region-specific socio-economic factors have on servitization capabilities be investigated.

Finally, it may be worth exploring whether the presence or absence of certain capabilities has an influence on the profitability of a manufacturing company's service offerings. Some of the annual reports sampled for the study referred to less than half of the capabilities from the capability framework. It would be useful to determine whether companies with fewer servitization capabilities are less likely to enjoy profits from their service offerings.

6.4 Conclusion

The aim of this study was to determine the extent to which the servitization capabilities implemented at sampled South African companies correlate with servitization literature. In addition, the study sought to determine whether any differences existed between the servitization capabilities referenced by South African companies versus those referenced by ENA countries.

It was observed that all the servitization capabilities mentioned in the literature were referenced in at least one of the annual reports contained in the samples. These servitization capabilities were however referenced by companies to varying degrees, with some companies referring to 90% of the capabilities mentioned in the capability framework, whilst others mentioned 30% or less. The researcher also noted that there were differences across the South African sample and the ENA sample regarding which capabilities each sample tended to be closely associated with. The results suggest that very few companies from either sample were found to be closely associated with capabilities that were significant differentiators. Furthermore, both samples rarely contained references to servitization capabilities associated with advanced services, these capabilities were also the same capabilities found to be amongst the more significant differentiators for companies.

While there is limited mention of the sales and legal capabilities in the literature (hence their exclusion from the capability framework) these capabilities were reported in some of the annual reports. The frequency of the reporting suggests that perhaps these capabilities should be given more attention as they may play an important role in a company's servitization strategy.

The study's findings have provided insight into the extent that the servitization capabilities from the literature were applied at the sampled companies. Additionally, the findings of this report agree with the findings of Weeks (2011) who states that there appears to be a correlation between the servitization capabilities implemented at South African companies and the servitization literature. The data also appears to suggest that there are differences between the capabilities South African companies emphasise and those that ENA companies emphasise. These findings have built on the existing literature whilst also introducing questions that may be addressed in future studies. It is the researcher's hope that the answers to these questions will lead to companies implementing only the combination of servitization capabilities necessary for their unique circumstances.

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7 APPENDICES

7.1 Appendix A

7.1.1 Appendix A.1 Stages of servitization

Table 7.1.1-1: Servitization stages

Stage	Literature based evidence
Stage 1: Fostering a culture of servitization. *Description:* The company shifts from a product-oriented organisation to one where a servitization culture is actively promoted and encouraged.	The absence of service-oriented values in a company can explain service failure (Edvardsson et al., 2013; Gebauer et al., 2010; Kohtamaki et al., 2015). Shifting a company's corporate culture towards one that embraces a service-oriented strategy can lead to servitization success (Coreynen et al., 2018). Companies are required to foster a service-oriented culture to aid servitization (Bowen et al., 1989). Some services may require an alteration to the company's strategy and culture (Avlonitis et al., 2001; Danneels and Kleinschmidtb, 2001; Schultz et al., 2013). The development of an organizational culture that facilitates service delivery is important for realising the financial benefits of servitization (Baik et al., 2019).
Stage 2: Knowledge gathering and sharing. *Description:* Knowledge about the customer's operations and strategy is gathered and will be used later to inform the service development process. Knowledge is also exchanged internally amongst employees of the company, fostering teamwork and cohesiveness.	Employees must converse with one another about potential ideas and spread strategy a culture of innovation to the external environment (Lievens et al., 1999). Companies must adopt a customer-oriented attitude. This includes listening to customers and communicating with them so as to gain an understanding of their operational needs (Neu and Brown, 2005). The willingness to share expertise and cooperate is essential along with the ability of employees to work together as well as with the client (Bettencourt et al., 2002; Oliveira and von Hippel, 2011; Ordanini and Parasuraman, 2011). "Reaching the detection stage is supported by a structured collection of information" (Vermeulen et al., 2005). Reducing uncertainty amongst employees regarding a service as well as the exchange of expertise between employees of various departments is critical (Stevens and Dimitriadis, 2005).

	The coordination of gained internal and external information allows for them to be refined and built upon (Stevens and Dimitriadis, 2005). A service can be adapted to the client's background using knowledge about its elements (Salunke and Weerawardena, 2014). Servitization begins with an understanding of the customer's business, needs and processes (Kanninen et al., 2017). Customers must be engaged during development to ensure "the outputs match their requirements and achieve high standards" (Cooper and Edgett, 2003).
Stage 3: Capability development. *Description:* The capabilities required to produce and deliver services are established.	The vendor must develop resources and capabilities along with the service attributes which the customer will receive later on (Graf and Helm, 2018). Capabilities and resources of both the vendor and its client are necessary for the new service development process (Graf and Helm, 2018). Factors that play an important role in the transition towards services include capabilities for service development and capabilities for service deployment (Coreynen et al., 2018). Capability development is a critical and ongoing phase of the servitization process (Kanninen et al., 2017). Manufacturing companies can develop capabilities using three alternatives, they include: internal, external, or mixed capability (Paiola et al., 2013). In order to reconfigure an organisation's structure and develop new services, external and internal resources and capabilities are required (Wang et al., 2016). Achieving financial benefits through servitization is dependent on factors such as the acquisition of capabilities required to servitize (Jovanovic et al., 2019). During each stage, the development of new capabilities is used to address a set of issues (Oliva and Kallenberg, 2003).
Stage 4: Service development and delivery. *Description:*	The difference between service development and product development is the extensive involvement of the client's capabilities and resources during the development of services (Graf and Helm, 2018).

The capabilities of the customer are considered and used along with information on the customer's operations, to develop product-support or product-centric services.	The process of service development should be long-term and should be collaborative with the customer (Brax and Jonsson, 2009). If service development is not approached as a collaboration with the customer where an advanced understanding of the customer's requirements is present, it becomes useless (Matthyssens and Vandenbempt, 2007; Ulaga and Reinartz, 2011). As service development progresses companies must employ cross-functional communication with the customer whilst planning actions frequently and taking into consideration the customer's goals (Storbacka, 2011). Those who understand a customer's business operations are valuable assets in the development of services (Kanninen et al., 2017). Once the company has set long-term goals, has a defined service strategy and the necessary organizational transformations, it must design structures and processes for "new service design, development, packaging, and delivery along with new pricing logics" (Kanninen et al., 2017).
Stage 5: Service expansion *Description:* Once the company has successfully provided and maintained product-support services for its customers, the company may begin to introduce advanced services.	During the expansion stage of servitization, the company's attention is shifted to the scaling of advanced services, thus creating a larger market segment (Baines et al., 2020). Firms in the service extension stage offer performance services and increasingly integrated whilst balancing business expansion and standardisation (Lütjen et al., 2017). The move to advanced services was considered an important part of servitization, where base and intermediate services are included in the service portfolio (Baines and Shi, 2015). Advanced services are often accompanied by features of long-term contracts; pay-for-use; risk management, and the commitment to continuous process improvement (Baines and Shi, 2015).

7.1.2 Appendix A.1 Servitization capabilities

Table 7.1.2-1: Servitization capabilities

Stage	Capabilities and literature-based evidence
Stage 1: Fostering a culture of servitization	***Service-oriented culture:*** ***The ability to foster a culture where employees embrace servitization and recognise services as crucial to the company's success.*** ***Evidence:*** A service-oriented culture and mindset is a prerequisite for servitization (Kanninen et al., 2017). A corporate culture that welcomes a service-oriented approach is advised for successful servitization (Coreynen et al., 2018). Positive company performance is associated with a service culture that is visible in the values and behaviours of management and staff (Gebauer et al., 2010). A service culture is required where services are perceived to add value and have clearly defined budgets, responsibilities and service structure (Lütjen et al., 2017). Changes to the company's culture, processes, structure and technologies are necessary for advanced services to be delivered (Baines and Shi, 2015).
Stage 2: Knowledge gathering and exchange	***Data gathering and exchange: The ability to gather information regarding the behaviors customer's operations and business strategy. This information along with the knowledge and expertise of employees and customers is exchanged within the organisation*** ***Evidence:*** Employees from different departments are required to exchange knowledge and information to decrease uncertainty about the service's peculiarities (Stevens and Dimitriadis, 2005). There must be a process of learning where information is gathered, the client's environment is understood and service adaptations can be applied to various backgrounds (Stevens and Dimitriadis, 2005).

	Employees were required to exchange knowledge and expertise in order for good performance to be achieved (Stevens and Dimitriadis, 2005). The quality of external communication is positively related to creating awareness and realistic expectations in clients (Lievens et al., 1999). During the service extension stage, the sharing of knowledge takes place easily and frequently (Lütjen et al., 2017). The exchange of expertise and information solidified the exchanges between front-office and back-office employees and subsidiaries were able to achieve improved operational efficiencies (Jovanovic et al., 2019). The capability to share and spread knowledge across the network has to be developed at the operational level (Oliva and Kallenberg, 2003). The ability to gather information on competitors and the needs of customers are critical for companies to progress towards a product-service business (Coreynen et al., 2018). An essential component of the innovation process is having knowledge about a customer segment's idiosyncrasies (Helm and Graf, 2018). ***Customer-centric configuration:*** ***The ability to create solutions and service products keeping the customer's capabilities, business model and strategy in mind. This includes the ability to collaborate with the customer effectively.*** ***Evidence:*** Employees must be customer advocates with a focus on developing a relationship with the customer that results in profitability through the customer's loyalty to them (Shah et al., 2006). Having an understanding of a customer's processes, business and needs is the start of the servitization process (Kanninen et al., 2017).

	Companies must adopt a customer-oriented configuration which requires that employees listen and communicate with customers in order to gain an understanding of their needs (Neu and Brown, 2005). Customer involvement and co-development with customers allows for the offering of integrated solutions and flexible services that solve customer-specific problems (Lütjen et al., 2017). Research has shown that the development of customer interface capabilities should be given priority (Davies et al., 2006; Sawhney et al., 2006).
Stage 3: Capability development	***Network management:*** ***The ability to create and leverage relationships with partners and customers thus allowing for knowledge, capabilities and other resources to be shared.*** ***Evidence:*** Network management is an important capability for deploying product-service combinations (Sjödin et al., 2016). Various cases showed evidence that support the importance of a value network that provides dependable access to suppliers and customers (Baines et al., 2020). Value network incorporates partner knowledge capability, orchestration capability and network dynamics understanding capability (Jovanovic et al., 2019). During service development and delivery, the resources and capabilities of manufacturing firms and their customers must be well coordinated (Helm and Graf, 2018).
Stage 4: Service development and delivery	***Service development and delivery:*** ***The ability to re-structure the organisation, including human resources, and introduce processes that facilitate the development and delivery of services.*** ***Evidence:*** Customer operations are used to create a service delivery infrastructure (Kanninen et al., 2017).

	Changes in human resource development, recruitment and compensation principles are required (Homburg et al., 2003). Deploying skilled human resources and efficient business processes to manage customer and supplier resources is essential during servitization (Baines and Lightfoot, 2014). Companies are encouraged to establish service management structures separate from the product-oriented business (Kanninen et al., 2017). ***Digitalisation:*** ***The ability to use ICT systems to simplify data processing and other administrative tasks.*** ***Evidence:*** IT tools support service design and service delivery (Kanninen et al., 2017). It is argued by case firms that IT systems and tools need to be upgraded immediately to enable service sale improvements (Kanninen et al., 2017). The capability to deploy a combination of products and services is related to digitization (Sjödin et al., 2016). Progression is significantly affected by the availability and access to digital technologies (Baines et al., 2020). Digitalisation of administrative work contributed to efficiency gains (Jovanovic et al., 2019).
Stage 5: Service expansion	***Customisation:*** ***The ability to tailor service offerings according to a customer's unique needs.*** ***Evidence:*** Knowledge about the client's background can be used to adapt the service (Salunke and Weerawardena, 2014). Mass service customisation is an important capability for deploying product-service combinations (Sjödin et al., 2016). Identified firms were establishing separate service development departments with staff who were qualified to provide custom solutions (Lütjen et al., 2017).

	A focus on effective customisation of services may be required for delivering highly innovative services (Lütjen et al., 2017). High levels of mass customisation capabilities are incorporated in various configurations (Jovanovic et al., 2019). Recommendations are for companies in paper, chemical and metal industries to develop customised product-service packages along with customised communication strategies for customers (Albert, 2003). ***Innovation:*** ***The ability to introduce new ideas, designs and processes to improve services.*** ***Evidence:*** An organisation's innovation strategy determines how the company's resources and capabilities are re-arranged (Edvardsson et al., 2013). Innovation is optimised during the exploitation stage (Baines et al., 2020). Companies have service-specific innovation processes during the service extension stage (Lütjen et al., 2017). Firms who are in the advanced stages of servitization have capabilities that result in intellectual property that differentiates them from others (Neu and Brown, 2005; Windahl et al., 2004). Xerox has the "technology innovation capability to understand and redesign the technology. to improve the efficiency and effectiveness of processes…" (Baines and Shi, 2015). One of reasons that can explain service failure is an approach to service innovation that is not properly suited (Morelli, 2006). It is critical to create a culture of innovation (Eisingerich et al., 2009; Stevens and Dimitriadis, 2005). Challenges related to implementation may be overcome by putting service-specific innovation processes in place (Lütjen et al., 2017).

	Scholars stress that business practioners should reconstruct their process of innovation development if the existing processes are not sufficient (Alghisi and Saccani, 2015; Baines et al., 2009; Kowalkowski et al., 2015) ***Value based pricing and selling:*** ***The ability to recognise and communicate the value in one's service offering. This ability then allows for the company to price service offerings based on value and not costs and mark-ups.*** ***Evidence:*** The ability to explain and promote advanced service-intensive value propositions (Kanninen et al., 2017). The ability to use information on customer operations and profitability to develop a new revenue mechanism (Kanninen et al., 2017). Firms should identify value drivers other than monetary ones (Kanninen et al., 2017). The ability of employees to communicate the benefit of a service that is customised for the client's background and work with new actors (Lievens et al., 1999; Stevens and Dimitriadis, 2005). The customer's perspective of value creation must be used to evaluate value propositions (Skålén et al., 2015). Advanced services can be considered as complex value propositions (Baines et al., 2020). ***Risk management: The ability to assess and manage risks associated with a service offering.*** ***Evidence:*** Strategy planning requires capabilities for managing risks related to a service offering (Storbacka, 2011). When a vendor takes responsibility for the risk of equipment failure, the way the service is priced changes from being based on markup for labour and parts every time the service is provided to being based on a fixed price encompassing all services during an agreed period (Oliva and Kallenberg, 2003).

	Organisations are willing to develop risk assessment skills through experience (Oliva and Kallenberg, 2003). A key feature of advanced services is risk management because the provider assumes responsibility for ensuring the availability of the asset, its condition and performance (Baines and Shi, 2015).

7.1.3 Appendix A.3 References by country

Table 7.1.3-1: Servitization literature by country

Paper	Country
Having a strategy for new service development - does it really matter? Edvarson et al., 2013	Germany, Sweden and Switzerland.
The impact of service orientation in corporate culture on business performance in manufacturing companies. Gebauer et al., 2010	Germany and the German-speaking part of Switzerland
The performance impact of industrial services and service orientation on manufacturing companies. Kohtamaki et al., 2015	Finnish industrial companies
An empirically-based typology of product innovativeness for new financial services: Success and failure scenarios. Avlonitis et al., 2001	Greece
Product Innovativeness from the Firm's Perspective: Its Dimensions and Their Relation with Project Selection and Performance. Danneels and Kleinschmidtb., 2001	Canada
Measuring New Product Portfolio Innovativeness: How Differences in Scale Width and Evaluator Perspectives Affect its Relationship with Performance. Schultz et al., 2013	Finnish
The internal ecosystem of high performance work system and employee service-providing capability: A contingency approach for servitizing firms. Baik et al., 2019	South Korea

Linking communication to innovation success in the financial services industry: a case study analysis. Lievens et al., 1999	Belgium
Forming Successful Business-to-Business Services in Goods-Dominant Firms. Neu and Brown, 2005	USA
Client Co-Production in Knowledge-Intensive Business Services. Bettencourt et al., 2002	USA
Users as service innovators: The case of banking services. Oliveira and von Hippel, 2011	USA
Service innovation viewed through a service-dominant logic lens: A conceptual framework and empirical analysis. Ordanini and Parasuraman, 2011.	USA
Identifying key determinants for new product introductions and firm performance in small service firms. Vermeulen et al., 2005	Dutch
Managing the new service development process: Towards a systemic model. (Stevens and Dimitriadis, 2005	France
Exploring the dynamic capabilities required for servitization: The case process industry. Kanninen et al., 2017	Finnish and nordic
Moving from products to solutions: Strategic approaches for developing capabilities. Paiola et al., 2013	Germany, Italy and Switzerland
Customer orientation and innovation : a comparative study of manufacturing and service firms. Wang et al., 2016.	China
aths to Service Capability Development for Servitization: Examining an Internal Service Ecosystem. Jovanovic et al., 2019	Multinational
Managing the transition from products to services. Oliva and Kallenberg, 2003.	Germany

Developing integrated solution offerings for remote diagnostics: A comparative case study of two manufacturers. Brax and Jonsson, 2009	Finland, Sweden
Creating competitive advantage in industrial services. Matthyssens and Vandenbempt, 2007	Netherlands
Hybrid Offerings: How Manufacturing Firms Combine Goods and Services Successfully. Ulaga and Reinartz, 2011	Europe
Service transitions of product-centric firms: An explorative study of service transition stages and barriers in Germany's energy market. Lütjen et al., 2017.	Germany
Servitization of the manufacturing firm: Exploring the operations practices and technologies that deliver advanced services. Baines and Shi, 2015	Britain
Charting a Path Toward Integrated Solutions Davies et al., 2006	UK, Sweden
Examining the critical interplay of knowledge acquisition and integration capabilities in project oriented service firms. Salunke and Weerawardena, 2014	Australia, USA
Capability configurations for advanced service offerings in manufacturing firms: Using fuzzy set qualitative comparative analysis. Sjödin et al., 2016	Sweden
The Role of Soft Factors in Implementing a Service-Oriented Strategy in Industrial Marketing Companies. Homburg et al., 2003.	Germany
Servitized manufacture: Practical challenges of delivering integrated products and services. Baines and Lightfoot, 2014	UK

Exploring value propositions and service innovation: a service-dominant logic study. Skålén et al., 2015.	Finland, Sweden
Managing Service Innovation and Interorganizational Relationships for Firm Performance: To Commit or Diversify? Eisingerich et al., 2009	Unclear
Internal and external alignment in the servitization journey—Overcoming the challenges. Alghisi and Saccani, 2015	Italy
A solution business model: Capabilities and management practices for integrated solutions. Storbacka, 2011	Multinational

7.2 Appendix B

7.2.1 Appendix B.1 Sampled South African companies

Table 7.2.1-1: Countries of operation

Company	Countries	Products sold	Services offered
Nampak	Angola, Botswana, Ethiopia, Kenya, Malawi, Nigeria, SA, Tanzania, Zambia, Zimbabwe.	Plastic, metal and paper products such as bottles, drums, cans and cartons (Nampak, 2022).	Technical Support, field engineers (Nampak, 2022).
AECI	Botswana, Brazil, Burkina Faso, Chile, China, Democratic Republic of Congo, eSwatini, Germany, Ghana, Guinea, Indonesia, Malawi, Mali, Mauritius, Namibia, Senegal, South Africa, Tanzania, United States of America, Zambia, Zimbabwe.	Surfactants for explosives manufacture and chemicals for ore beneficiation (AECI, 2022).	Detonation services, technical support (AECI, 2022).

Adcock Ingram	India, South Africa.	Pharmaceuticals (Adcock Ingram, 2022).	Regulatory support services, peritoneal dialysis, pathology services (Adcock Ingram, 2022).
Bell	Australia, France, Germany, Russia, Singapore, South Africa, United Kingdom, Zambia, Zimbabwe.	Trucks and ADTs (Bell, 2022).	Aftermarket services (Bell, 2022).
RCL Foods Limited	Botswana, eSwatini, Namibia, South Africa, Uganda, Zambia.	Food products such as flour, chicken, sugar and maize meal (Bell, 2022).	Provision of technical expertise and support in the animal feed and industrial flour sectors (Bell, 2022).
Hulamin	South Africa.	Rolled, extruded aluminium and aluminium containers (Hulamin, 2022).	Design and technical support services (Hulamin, 2022).
Insimbi	South Africa.	Aluminium products and moulded plastic parts (Insimbi, 2022).	Collecting and processing recycled material. Technical support and “mechanical” services (Insimbi, 2022).

Master Drilling	Australia, China, Finland, France, India, Ireland, Norway, Sweden, Turkey, Botswana, the DRC, Ghana, Mali, Namibia, Sierra Leone, South Africa, Zambia, Zimbabwe, Canada, Mexico, USA, Brazil, Chile, Colombia, Ecuador, Peru.	Drilling equipment (Master Drilling, 2022).	Consulting, operating, design, training, support and maintenance. Advanced services suggested by the company mentioning that: "the principle of renting out or operating and not selling our rigs, which we design and build mainly in-house, is something we place high value on as it helps us remain agile" (Master Drilling, 2022).
Mpact	Mozambique, Namibia, South Africa.	Plastic and paper packaging (Mpact, 2022).	Ethical onsite waste management services and solutions (Mpact, 2022).
Sappi	Austria, Belgium, Finland, Germany, Italy, Netherland, South Africa, United Kingdom, United States of America.	Pulp, biomaterial, timber, packaging and speciality papers, graphic papers, casting and release papers and forestry products (Sappi, 2022).	Research and design services as well as testing services (Sappi, 2022).

7.2.2 Appendix B.2 Sampled European and American companies

Table 7.2.2-1: Company product and service offerings

Company	Location	Products	Services
Axcelis	USA	ion implantation and other processing equipment used in the fabrication of semiconductor chips (Axcelis Technologies Inc, 2022).	Aftermarket lifecycle products and services, including used tools, spare parts, equipment upgrades, maintenance services and customer training (Axcelis Technologies Inc, 2022).
Terex	USA	manufacturer of aerial work platforms and materials processing machinery. portable material lifts, portable aerial work platforms, trailer-mounted articulating booms, self- propelled articulating and telescopic booms, scissor lifts, utility equipment (including digger derricks and insulated aerial devices) and telehandlers, as well as their related components and replacement parts. materials processing and specialty equipment, including crushers, washing systems, screens, trommels, apron feeders, material handlers, pick and carry cranes, rough terrain cranes, tower cranes, wood processing, biomass and recycling	"A range of services for aerial and utility products consisting of inspections, preventative maintenance, general repairs, reconditioning, refurbishment, modernization and spare parts, as well as consultancy and training services" (Terex Corporation, 2022).

		equipment, concrete mixer trucks and concrete pavers, conveyors, and their related components and replacement parts (Terex Corporation, 2022).	
Teleste	Finland	Amplifiers, video security systems, LCD displays (Teleste, 2022).	Network design, installation, commissioning, maintenance (Teleste, 2022).
UPM	Finland	Pulp, paper, labelling and packaging material, wood-based biofuels and biochemicals (UPM, 2022).	Forest management, recycling (UPM, 2022).
Viscom	Germany	Electronics inspection tools (Viscom, 2022).	Condition monitoring, predictive maintenance, maintenance, calibration, repairs (Viscom, 2022).
BAE Systems	Britain	Military vehicles, ships, aircrafts and equipment (BAE Systems, 2022).	Facility management, maintenance, support, training, digital services, ship repair, refurbishment (BAE Systems, 2022).
Mycronic	Sweden	Printed-circuit board assemblies (Mycronic, 2022).	Maintenance (Mycronic, 2022).
Rieter	Switzerland	The company develops and manufactures machinery, systems and components used to convert natural and man-made fibres and their blends into yarns (Rieter, 2022).	Supervision of installed machines, planning services, machine efficiency improvements (Rieter, 2022).
SLM	Germany	produce and sell machines for the additive manufacturing of metal parts (SLM Solutions, 2022).	The service portfolio includes, among others, benchmark production, production services, consulting, and various additive manufacturing training as well as machine services and consumables (SLM Solutions, 2022).
Nolato	Sweden	Products in polymer materials such as	Consulting, concept development, design, supply chain (Nolato, 2022).

		plastic, silicone and TPE (Nolato, 2022).	

7.3 Appendix C

7.3.1 Appendix C.1 Coding scheme

Table 7.3.1-1: Coding scheme

Category	Code	Description	Example
Service oriented culture	Service orientation	An emphasis is placed on services. Services being recognised as important to the company strategy. Investments or budgets being allocated for provisioning of services. A commitment to providing quality/excellent services.	"Our significant investment in skills, science and service over eight decades should not be overlooked and should stand us in good stead in future" (Nampak, 2022).
Data gathering and exchange	Employee engagement	Communication, engagement, collaboration and sharing of knowledge and expertise amongst employees and between management and employees.	"We tap into AECI's intellectual capital by asking our people to suggest ideas for growing our business or reducing costs." (AECI, 2022).
	Customer knowledge	Seeking to understand and having knowledge of the needs, goals, strategy and operations of the customer. Also includes gaining knowledge on how customers use the company's products and services.	"Maintaining close contact with our customers improves our service to them"
Customer-centric configuration	Customer-centricity	Using customer knowledge and the relationship with them to design and deliver solutions that address	"We work side by side with our customers, often on their own sites, to ensure they

		their specific needs and goals.	derive maximum benefit from our solutions and know-how" (AECI, 2022).
Network management	Partner relationships	Relationships, partnerships and sharing of knowledge and resources with suppliers, industry bodies, universities, government and competitors to develop service capabilities. Includes leveraging the capabilities of others in the network for the development and delivery of services.	"In 2021, AECI Mining's partnership with blasting engineering firm, DetNet, advanced further in the field of wireless detonation" (AECI, 2022).
Customisation	Custom services	Alteration and modification of existing services, their function or design according to a customer's needs or specification resulting in custom services or solutions.	"Our scientific and technical personnel working in state-of-the-art laboratories adapt these to tailor-make customer solutions" (AECI, 2022).
Service development and delivery	RD	The research, processes, structures and activities related to the design and development of services.	"To maintain high standards of technical performance and to contribute to ensuring the provision of medicines to treat priority diseases in middle- and low-income countries, the R&D department participates in WHO

			Programmes which promote an increase in the availability of high-quality medicine testing services" (Adcock Ingram, 2022).
	Service enabler	Any resource, structure or process that exists to facilitate or enable the delivery of services.	"Our expansive dealer network is supported by strategically placed, locally staffed Bell owned operations and a network of logistics centres that are ideally positioned to provide quick and efficient parts supply across the globe and the group continues to invest in this support structure" (Bell, 2022).
	HR	Employees with the skills and expertise required to develop and deliver services. Human resource structures, policies, processes, or management structures that have been put in place to facilitate the development and delivery of services.	"We continue to invest in developing technical resources to manage and run our operations; our field service engineers support our customers in their factories" (Nampak, 2022)
Digitilisation and digitisation	Digitilisation/digitisation	Digitilisation/digitisation and the implementation of digital products/infrastructure and ICT to aid business	"Our digitalisation drive is also making it much easier for our

		operations and design and deliver services (excludes digital tools introduced specifically to aid manufacturing). Includes the application of data science and machine learning to improve business operations and service-related activity.	employees, wherever they are, to automate routine tasks" (AECI, 2022).
Innovation	Innovating	Research into developing innovative services, implementing new service ideas and offering novel or unique services.	"In pursuing Better Mining, we intend commercialising our two-component booster (PowerBoost™) and carrying out further field trials with our innovative new wireless detonator (CyberDet™, pictured below), with advanced technological and safety features" (AECI, 2022).
Value-based pricing and selling	Value-based strategy	Using knowledge and understanding of the customer's operations to provide value to the customer. Using customer information to develop a new revenue mechanism. Pricing services based on their perceived value rather than by using costings and markups.	"We are looking at creating value by providing a full turnkey solution and a fully integrated system" (Master Drilling, 2022).
Risk management	Risk managing	Activities related to the identification,	"It is also AECI.GO's

		management and mitigation of risks associated with the company's service offerings.	responsibility to identify, quantify and communicate all risks attached in each case for mitigation by our ERM and combined assurance structures" (AECI, 2022).
Other	Legal	The resources and capability to handle matters relating to patents, intellectual property, compliance, licenses, contracts and any other legal issues related to the company's service activities.	"Rigorous service level agreement with key logistics service provider, with regular monitoring of service levels achieved" (Adcock Ingram, 2022).
	Sales	All operations and activities that facilitate the sale of service offerings.	"Dedicated sales interface team that uses "best in class" service methodologies" (RCL Foods Limited, 2022).
	Adaptability	Activities and resources related to the company adapting and adjusting its service-related activities to changes in their external environment.	"Explosives' electronic initiation support team could not travel to some customers in West Africa, we deployed our LogShot™ technology to extract data from detonator units" (AECI, 2022).

7.4 Appendix D

7.4.1 Appendix D.1 Frequency of codes per company

Table 7.4.1-1: Code frequency

	Service-oriented culture	Data gathering and exchange	Customer-centric configuration	Customisation	Service development and delivery	Network management	Digitalisation	Innovation	Value-based pricing and selling	Risk management	Other
Nampak	1	0	1	0	2	0	2	0	0	0	0
AECI	0	5	6	1	2	4	14	3	0	1	1
Adcock Ingram	2	5	0	0	2	2	11	1	0	1	3
Bell	5	5	2	0	2	1	10	0	0	0	0
RCL	1	2	1	0	1	0	7	0	0	0	2
Hulamin	0	0	0	0	0	0	1	0	0	0	0
Master Drilling	3	1	3	1	3	0	12	13	2	1	0
Mpact	0	0	1	0	2	0	0	1	0	0	0
Sappi	0	0	0	0	0	0	4	0	0	0	0
Axcelis	2	1	0	0	7	0	3	0	0	0	2
BAE	0	6	0	0	1	2	1	2	3	0	0
Mycronic	2	5	1	0	5	0	1	0	0	0	1
Nolato	0	4	6	3	1	0	2	0	0	0	0
Rieter	1	0	0	0	1	0	0	1	0	0	0
SLM Solutions	7	4	0	3	3	0	3	0	0	0	2
Teleste	0	2	1	0	4	2	3	0	0	0	0
Terex Corporation	0	0	0	0	2	0	3	2	0	0	0
UPM	0	5	0	0	2	0	8	0	0	0	0
Viscom	0	1	1	2	8	0	1	1	0	0	1