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Development of a framework for the management of risk for SME's in South Africa that outsource some, or all, of their manufacturing requirements

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ABSTRACT

Small companies routinely outsource their payroll processing, accounting, distribution, and many other important functions - often because they have no other choice. Similarly, manufacturing SMEs (mSMEs) may choose to outsource some of their manufacturing to a local agent. This strategy can realise many benefits, but these are weighed against heavy risks. This research investigated the major benefits, risks and risk management strategies in industry through in-depth, semi-structured interviews of the owner-managers of four selected local mSMEs. The results were then analysed using thematic analysis techniques and compared to those found in literature, ending in an emergent conceptual framework and a suggested approach for owner manager to the topic.

The key benefits South African mSMEs seek when outsourcing manufacturing are a reduction in capital and operational expenses, decreased time to market and the ability to focus on their core competencies. South African mSMEs do not outsource in order to gain increased flexibility. The major risks they are exposed to can be grouped into quality, time/speed, financial and legal based risks. There is little knowledge transfer from literature to industry with regards to risk management. South African mSME owner-managers approach to this has, however, evolved through experience to a point where it closely mirrors suggested best practices. They employ multiple strategies that fall within risk avoidance, control, assumption and transfer categories. Of note in South Africa is the importance of the relationship between the principal and agent as this facilitates and enhances all aspects of risk management for local outsourced manufacturing.

This thesis is dedicated to my darling wife, Margot, who's continual encouragement and love pushed me through the darkest nights.

And to my son, Luke, who brings evergreen joy into my life.

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CHAPTER 1 INTRODUCTION

1.1 RESEARCH BACKGROUND/CONTEXT

Small and medium enterprises (SME's) are a key contributor to the South African economy. It is estimated that they provide up to 60 percent of the jobs and roughly 38 percent of the gross domestic product for the country (1, 2). Based on South African economic information in 2019, provided by The Small Enterprise Development Agency (2), the number of SME's operating in South Africa has increased by 4.4 percent year-on-year. This has occurred while the fiscal health of the country is severely strained with the gross domestic product (GDP) growth estimated to be an average of 1.1 percent over the past five years (2). In addition, weak business confidence and low capital spending characterise the South African economy (2). These poor economic conditions are most prevalent in mining, manufacturing, electricity, water and construction (2). Manufacturing SMEs (mSME) are, thus, under severe pressure.

Johnson (3) highlighted that one of the major factors influencing a small (mSME) company is that they typically suffer from higher manufacturing costs (3). Thus, reducing the cost of goods sold should be of importance to them. To achieve a low production cost, mSMEs may choose to outsource the manufacturing of some, or all, of their products (4). As many as 84 percent of enterprises in an American study, including SMEs, outsource some, or all, of their manufacturing (5).

By outsourcing certain non-core manufacturing, a firm can reduce its capital expenditure for specific manufacturing assets (and associated costs such as fixed overheads), take advantage of the suppliers perceived economies of scale (if it is a large, focused manufacturing firm) and gain access to the capabilities of the supplier in addition to various other benefits (3, 6). However, in conjunction with these benefits, there is a perception of multiple risks and pitfalls (6). These negative consequences may take the form of deliberate underperformance, the misuse of confidential information, opportunistic renegotiation by the contracted manufacturer (7) among others. Outsourcing may then present a set of risks to the firm.

mSMEs may outsource a number of non-core activities for various reasons. These may include manufacturing, information technology and legal services (4). In light of the possible negative consequences of outsourcing, mSME owner-managers need to be able to successfully manage these risks in order to gain the rewards (or benefits) of local outsourced manufacturing. Thus, this research seeks to present the knowledge in literature, that is available, as well as information from industry, with the aim of developing a conceptual model with which owner-managers can approach outsourcing risk. In addition, as an implication of this research, for owner managers, some key points and considerations for risk management of local outsourced manufacturing are presented.

For the purposes of this research, locally outsourced manufacturing refers to a SME firm (or Principal) who subcontracts part or all of their required manufacturing to a South African manufacturer (or Agent). The agent performs manufacturing operations on behalf of the principal using resources located within the borders of South Africa.

1.2 PROBLEM STATEMENT/MOTIVATION

SMEs within South Africa, that require items to be manufactured, may consider outsourcing their manufacturing. However, in order to successfully navigate the risks associated with locally outsourced manufacturing such as: deliberate underperformance, the misuse of confidential information and opportunistic renegotiation by the contracted manufacturer (7), and, thus, gain the perceived advantages of it, mSME's must be able to identify the risks and apply the relevant risk management strategies. Hiebl (2015) found that risk management capabilities in SME's vary from firm to firm and are heavily influenced by the characteristics of the SME owner such as his/her experience and education (8). Thus, it would appear that a structured framework dealing with risk management for outsourced manufacturing would be of benefit to mSME owner-managers.

Based on a perusal of existing literature, such a framework does not currently exist for local outsourcing within the South African context. This research, thus, seeks to investigate the risks that SMEs are exposed to when outsourcing some, or all, of their manufacturing while still gaining the supposed benefits of this strategy and develop a framework for the management of these risk.

1.3 CRITICAL RESEARCH QUESTION

The Critical Research Question for the proposed research is:

"How can a small and medium sized manufacturing enterprise effectively manage the various risks associated with local outsourced manufacturing within South Africa?"

1.4 RESEARCH OBJECTIVES

The purpose of this research is to propose a framework to assist small and medium sized manufacturing enterprises (mSMEs) to manage the various risks associated with local outsourced manufacturing within South Africa.

This will be accomplished by:

1. Developing a conceptual framework, from the literature, for risks and risk management concerning the outsourcing of manufacturing in SMEs,
2. Investigating how selected South African small and medium manufacturing enterprises manage risk concerning their outsourced manufacturing activities, and
3. Developing a risk management framework for South African small and medium enterprises to guide them in successfully navigating the risks inherent to outsourced manufacturing.

1.5 SUMMARY OF RESEARCH METHOD

This research is qualitative in nature. Thus, the research methods are aligned with this. Briefly, the research follows the structure given below:

First, a review of existing literature was conducted. This was followed by the development of a conceptual framework. This conceptual framework then allowed for the development of a set of interview questions based off the methods proposed by Wengraff (2000) (9). Following this, a series of interviews, with industry experts, was conducted and transcribed. These transcripts were then analysed using thematic analysis techniques and descriptive statistics. The understanding emerging from this analysis was then condensed into a framework that will guide industry participants in the best practices for the management of risks associated with outsourced manufacturing.

The ethics clearance number for this research is MIAEC 166/19.

1.6 DELIMITATIONS

In delimiting the scope of this research, the following criteria act as natural boundaries:

1. Only selected mSMEs are investigated,
2. The research will not consider supply risks outside of outsourced manufacturing,
3. Risks that occur post manufacturing (i.e. Distribution),
4. Demand side risk management,
5. Global risk management,
6. The research shall not develop or present a methodology for a firm to follow in deciding to follow outsourced manufacturing (i.e. the make or buy decision), as opposed in in-house, as a strategy,
7. Risk management strategies for outsourced manufacturing of prototypes (which is perceived to have considerably more risk), and
8. Risks management for offshored manufacturing.

1.7 OUTLINE OF CHAPTERS

The following section briefly outlines the content of the chapters in the report.

CHAPTER 2 LITERATURE REVIEW

The literature review details the results of a study into topics surrounding outsourced manufactures and its impact on SMEs. The general aim of the section is it to go from broad and generic to information specific to this research. First, key concepts in outsourcing are discussed as well as the potential benefits an SME might receive though this practice. Second, risk is examined in its broadest sense, that is, its definition, key characteristics and classifications. Following this, a brief discussion on the nature of risk, considering that it is subjective and in a constant start of flux. The literature review examines what risks a manufacturing firm is exposed too. Last, key concepts in risk management are explored, this section details a generic risk management strategy as well as the classification system used when defining risk management strategies.

CHAPTER 3 RESEARCH METHODS

The Research Methods section of this report details the process followed in carrying out this research as well as explaining why the selected methods where chosen. Throughout the process, attempts were made to ensure the reliability and validity of the work.

CHAPTER 4 RESULTS

Four (4) interviews were conducted with owner-managers of mSME's that fulfil the criteria set on in the sampling section. The audio recordings were then transcribed to facilitate the content analysis process and allow for the extraction of relevant quotes. The content was analysed using the deductive codes given in Section 2.4. In addition, there were some new emergent codes.

CHAPTER 5 DISCUSSION

The discussion examined the results in relation to literature, the deductive codes and inductive codes. It examines each major theme that forms the foundation of the CRQ and, subsequently, answers it.

CHAPTER 6 REVISED CONCEPTUAL FRAMEWORK

This section presents a revised conceptual framework on the topic, based off the understanding that emerged from the research process. In addition, a practical guideline is presented for owner-managers.

CHAPTER 7 CONCLUSION

The conclusion briefly summarises the important findings of this research and highlights why they are important to both industry and academia. In addition, further recommendations are made for future work.

CHAPTER 2 LITERATURE REVIEW

This literature review explores the concept of outsourcing generally and more specifically in SMEs, this is followed by an introduction to the key concepts in risk and risk management. Finally, a conceptual framework for outsourcing risk management in SMEs is presented.

There is a significant amount of information available on the key topics that inform this research. However, the combination in relation to SMEs in the South African context has seen little attention.

2.1 OUTSOURCING

Outsourcing refers to the contracting or subcontracting of activities (such as manufacturing, information technology (IT) and legal or, in specific reference to this research, externalising of manufacturing activities) to an agent (4). Externalising manufacturing is often done in the belief that it offers a lower average unit cost. Additionally, it may be done to make available cash, personnel, time or facilities for activities in which a company holds competitive advantage (10, 11). However, as pointed out by Akbari and Hopkins (2016), it does lead to an increase in project complexity (11). With this increased complexity, the transaction cost may increase. Where transaction costs are all of the costs a firm would incur when buying goods or services. An example of these costs are the cost of labour, management resources and transport costs (12).

The identification and selection of effective outsourcing practices is essential in allowing a firm to maximise the benefits it realises and to minimize the potential negative aspects (11). In this research, the firm engaging in the outsourced manufacturing is termed the principal and the manufacturer is termed the agent. Outsourcing, in this context, differs from off-shoring where off-shoring refers to sourcing of an agent who is located abroad. Three general levels of outsourcing identified in literature are, tactical, strategic and transformational. Tactical outsourcing is suggested for quick resolution of short-term business problems, strategic outsourcing allows for a firm to focus on its core competencies (and is more long term in nature) and transformational outsourcing allows a firm to respond to changes in its environment, such as globalisation and digitalisation (11). Strategic outsourcing is used by a principal in order to preserve their core-competencies and value-creating actions. Transformational outsourcing allows the principal to respond to market changes (11). These three levels allow for the general grouping of outsourcing strategies and assist the principal in the selection of the appropriate management tools.

A starting point is to examine the benefits or motives of outsourcing as this provides context as to why a firm might choose to engage in this practice. These benefits or motives are summarised below and have been drawn from information specific to mSMEs and supported by information from studies investigating outsourced manufactured at larger firms:

1. It allows the mSME to focus on their core competencies (6, 13, 14),
2. The mSME may benefit from a reduction in capital costs and operational expenses (6, 13, 14),
3. The enterprise may gain access to external capabilities (thus improving quality of goods manufactured) (6, 13, 14), and
4. The enterprise can gain increased flexibility (6, 13), where flexibility includes the ability of the enterprise to respond to changing client demands as well as the speed of uptake of new technologies (13).

These points are a common thread through much of the literature around the perceived benefits of outsourced manufacturing (5) and are similar to the benefits gained by an mSME that offshores its manufacturing, however, the risk profile is different (15). Lars (2009) points out that an organisation cannot excel in all functional areas at the same time and, thus, should focus on its core competencies/activities and consider outsourcing other areas of the business (4). Additionally, an mSME may choose to outsource its manufacturing as it allows it to compete against with much larger firms (13). In a recent Iranian study (11), it was found that the primary reason for SMEs to engage in outsourcing practices is to gain access to external capabilities. This decision is made by the SME in the hope that it allows them to cope with a major transition in the firm (an example being given as the introduction of new technology) (11). Further to this, SMEs typically outsource on a strategic level (11). This is important to note as it should lead to SMEs applying management practices at a strategic level in order to cope with outsourcing. However, as this study focused on all forms of SMEs within Iran, it may not hold true for manufacturing SMEs in South Africa. It is interesting to note that the benefits listed above are not mutually exclusive. Lars (2009) differentiates between outsourcing for low-cost versus innovation, where each strategy seeks different goals that are exclusive of each other's and these different strategies will lead to exposure to different risks (4).

A second dimension in outsourcing is the degree to which a firm outsources a function. A Finnish study (16) on SMEs found that the degree of outsourcing is a function of the outsourcing motive (16). Benefits (or motives) one and two, listed above, typically lead to higher degree of outsourcing while benefit three exhibits a lower degree (16). The degree is linked to the percentage that a function is outsourced. It can be partial or fully outsourced where partial outsourcing will allow the principal to retain an element of internal capabilities with regard to the function (16). The degree to which a function is outsourced will affect the firm's exposure to potential risks but, conversely, may realise greater returns. However, outsourcing is not an all-encompassing solution for improving a business if the benefits are not realised through selection and application of the correct strategy (17). The risks associated with outsourcing and SMEs are dealt with in subsequent sections.

An important aspect for mSMEs in outsourcing is the selection of the appropriate suppliers. Kumari *et al* (2014) gives a detailed set of criteria (13), summarised below:

1. Availability of the agent (13). This refers to the agent being able to fulfil the required work (18), in the desired timeframe, given their existing workload or order book.
2. Transaction Cost (13). This includes all the expenses the principal will incur when engaging the agent (12), including direct costs as well as indirect costs such as travelling to and from the agent for monitoring purposes. The transactions costs are influenced by the quality of the relationship, with the relationship being built on mutual trust (19).
3. Reliability of the agent (13) with reference to their trustworthiness and performance consistency (20).
4. Capabilities of the agent in terms of engineering expertise, facilities, equipment and production capacity (13).

A further criterion for the selection of a supplier for an mSME is the quality of the relationship between the principal and agent. This was highlighted in the study performed by Sunjka and Emwanu (2015) where they found that South African SMEs consider the relationship between themselves and their suppliers of primary importance (21). The quality of the relationship will assist in reducing the transaction costs because, as trust between the principal and agent increases, the cost of the transaction will decrease as the need for extensive monitoring or quality control will decrease over time (19). Thus, the transaction cost, beyond the simple monetary value, will affect the principal's exposure to risk.

The decision of a firm to outsource its manufacturing is essentially a make or buy decision (19). This is extensively covered by literature based off transaction cost theory. Due to the extensive depth and breadth of transaction cost theory only the briefest definition will be given where it is defined as a method for questioning whether a transaction (in this case, make or buy) is more efficient when performed within or outside of a firm (22).

2.2 DEFINITION OF AN SME

Small and medium manufacturing enterprises (mSMEs) in South Africa are defined by the National Small Business Amendment Act No.29 (2003) which supplies a quantitative means of classification (23). This is given in the Table 1.

Table 1: SME legal classification

Sector or subsector in accordance with the Standard Industrial Classification	Size of class	The total full-time equivalent of paid employees	Total turnover	Total gross asset value (fixed property excluded)
Manufacturing	Medium	200	R51m	R19m
	Small	50	R13m	R5m
	Very Small	20	R5m	R2m
	Micro	5	R.20m	R0.10m

As highlighted by Sunjka and Emwanu (2015), the act has been criticised for not providing clarity on whether one or all of the criterion need to be satisfied (21). In addition, the act makes no provision for inflation-based increases from the time it was gazetted (21).

Further to this, a manufacturing SME is defined as fulfilling the preceding criteria as well as falling within the standard industrial classification (SIC) system subdivisions for the manufacturing sector. These are codes with the 31 to 33 groups and spans food to furniture manufacturing (a full list is given in Appendix E) (24). Additionally, the mSME must qualify for membership to the Steel and Engineering Industries Federation of South Africa (25). These criteria include firms that manufacture electrical equipment, light metal products, pressure vessels, valves and pumps (25). These two additional criteria bound the market, in the South African context, to a firm the engages in internationally recognised manufacturing activities that manufacture goods for the metals and engineering sector.

2.3 RISK

The first step in the journey of understanding is to start with an appropriate definition of how literature defines risk. The American Department of Defence (2001) defines risk as:

> "The potential for a negative future reality that may, or may not, happen." (26, p.153)

They go further to say that it can be described by two main characteristics. First, the probability of occurrence. This describes the chance that a given event (or future negative reality) will occur, some synonyms for **probability** are likelihood, possibility and chance (27). Second, the **consequence** of occurrence, this

describes the magnitude of the events effect. The magnitude is often given in financial terms but can include injury/loss of life and/or reputational damage to an organisation (26). In addition, both of the characteristics are further classified into low, medium or high-risk categories. Risk is inherent in all business functions and in every kind of activity (28). This categorisation assists in the selection of appropriate management strategies (See Section 2.4). This multi-dimensionality aspect of risk indicates that it is a complex phenomenon with many manifestations in life and business. In turn, this implies that it should be treated with the appropriate amount of respect in order to understand and attempt to manage it.

Table 2: Risk Classification (26)

	Low risk	Moderate risk	High risk
Consequences	Insignificant cost, schedule or technical impact.	Affects program objectives, cost or schedule; however cost, schedule, performance are achievable.	Significant impact requiring reserve or alternate courses of action to recover.
Probability of occurrence	Little or no estimated likelihood.	Probability sufficiently high to be of concern to management.	High likelihood of occurrence.

Table 2 suggests definitions of each category but they would be tailored to the specific firm applying them (26). Damodaran (2007) goes further into examining the nature of risk which he argues is in a state of constant flux (29) and changes over time. This implies that an organisation should be continually revaluating the risks they are exposed to and should expect that new risks arise while previously identified risks experience a change in their characteristics or fall away completely (29). Redmill (2002) suggests that a characteristic of risk is its subjectivity (30). Each step in the management process, including determining the consequence or probability of occurrence, is approximated by the person performing the task. He states that the judgement of the person performing the analysis is critical when going through the process as well as in using the results. However, as judgement capacity is inherent to the person, it will be affected by their understanding of risk management as well as their risk propensity. Hiebl (2015) confirms this through stating that the owner-managers character traits significantly impact an SMEs risk management practices (8). In addition, differences were found in the risk appetite between Western managers and managers of SME's in developing nations, where the managers from developing nations are more risk averse when compared to their counterparts (8). Other factors that influence a SME owner-managers approach to risk are age, gender and education level (8). It is expected these factors will affect the level of sophistication exhibited by an SME in terms of risk management practices. Henschel (2010) uncovered that, above these factors, the sector in which a SME operates in will affect its approach to risk and risk management, where as a sector tends towards a higher level of technology, it is expected that firms within that sector exhibit more sophistication towards the topic when compared to lower technology sectors (i.e. Engineering and IT versus trades and construction) (31). Thus, the

owner-manager/s of an SME will significantly affect his/her firms approach to risk, ultimately leading to policy decisions that either harm the firm or lead to its betterment.

With specific reference to SMEs, risk can be grouped into three high level forms or types based off the root causes. These are given as uncertainty, opportunity and hazard-based risks (32). First, Opportunity based risks are those which arise from an SMEs decision to pursue an opportunity or not. Second, Uncertainty based risk emerges from events that cannot be predicted, an example of this would be a natural disaster. Last, Hazard based risks are linked to risks that may cause harm to a person/s (32), an example of this would be a slip and fall hazard and the risk it poses to employees. Within each form, there exists multiple categories of risk. These are strategic, operational, financial and compliance risk among others (6, 32). The top risks an SME is exposed to is given in the subsequent sections. What is apparent is the diverse sources of risk and how it infiltrates all aspects of a business.

SME RISK

In order to narrow the focus of this literature review to the types of risk that are relevant to this research, this subsection presents the most prevalent categories of risk that SMEs are exposed too based off current literature. Following from this, there is a laser focus upon supply chain risk as outsourcing one's manufacturing moves the action of manufacturing externally, into the supply chain. Both demand side and supply side risks are considered as this gives a complete picture of the supply chain. However, specific attention is given to supply side risks as this is where the agent, who performs the manufacturing actions, lies. Thus, it should be apparent that risk in SMEs is dealt with from a general point of view down to a very specific niche of risk. Why the management of risk is essential for an SME and their effect on an SME is expanded upon in Section 2.4 Risk Management.

The top risks SMEs are exposed to have been identified as:

1. Interest rate risk. According to Hiebl (2015), SMEs are, to a large degree, dependant external finance. Thus, this external finance is subject to interest rates and is a form of financial risk (8). This is an uncertainty-based risk.
2. Raw material price risk. SMEs are postulated to have a higher exposure to raw material price volatility (8). It is expected that this will affect a manufacturing SME to a larger degree than other forms of SMEs. This is an uncertainty-based risk.
3. Technology based risks. The source of these risks would be from the implementation of modern software platforms in an SME such as e-trading and enterprise management systems (8). This is an opportunity-based risk.

4. Growth risks. Hiebl (2015) points out that there are contradictory studies that point to SME owner-managers viewing growth as a business risk versus not a risk (8). The arguments for and against seem to be isolated to different regions/countries which implies that they view of the owner-managers is moulded by the regional policies and social environment (i.e. First world business owners versus owner managers from developing nations. This is an opportunity-based risk.
5. Knowledge based risk. This type of risk is based on employees leaving an SME with some form of tacit knowledge. This is a recognised risk for SMEs but there is little research done on how an SME might successfully manage/mitigate this form of risk (8). If an SME operates in a high technology and, thus, knowledge intensive sector, it would be expected that this becomes a significantly higher risk when compared to SMEs that operate in less sophisticated sectors. This is an opportunity-based risk.
6. Supply chain risk. This form of risk is covered in the next two subsections and is made up of both demand side risk as well as supply side risk (8). These risks may fall into either opportunity or uncertainty-based categories depending on the nature of the specific risk.

SME DEMAND SIDE RISKS

Figure 1 (3) below, gives a depiction of the difference between demand and supply side risks, allowing for the clear demarcation of the source of risks. The principal firm, a mSME for this research, is positioned at the nexus. All the inputs to it (in the left-hand circle) comprise of the supply side and, hence, are the primary sources of supply side risks. All of the outputs (in the right-hand circle) comprise of the demand side of the organisation and, hence, form the primary sources of demand side risks.

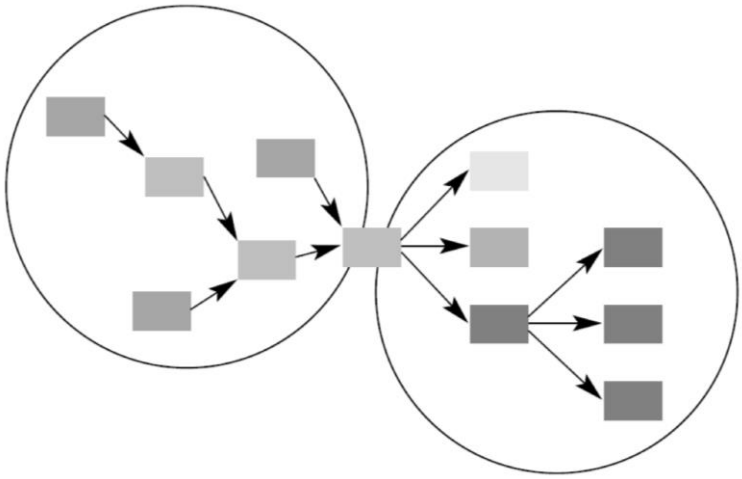


Figure 1: Firm Organisation (3)

Demand side risks typically occur due to the potential difference between actual demand and that which was forecasted (34). When a firm forecasts the demand for their product, this information feeds back to the supply side and determines the quantity of products to be manufactured (if it is a manufacturing firm). An example

of a demand side risk would be one that arises due to customers paying late for goods which could lead to constrained cash flow problem for the principal (21). Sunjka and Emwanu (2015) highlights that demand side forecasting is difficult in South Africa which would imply that SMEs are vulnerable to this form of risk (21).

SME SUPPLY SIDE RISK

Supply side risks can be defined as risks that "adversely affect inward flow of any type of resource to enable operations to take place" (35, p. 53). In the context of this research it will be confined to those specifically related to the outsourced manufacturing of products/goods. These risks are significant for SMEs as they typically follow a single sourcing strategy (for various reasons) (8). However, due to many outsourced goods coming from a single supplier, any disruptions will affect the SMEs supply chain (8). Aron *et al* (2005) gives two main reasons as to why these risks might occur (7). First, through the activities at the manufacturing agent been unobservable to the principal which would allow for nefarious actions on the part of the agent. Second, unintentional risk might occur as a result of the agent having incomplete information or inadequate experience. Outsourced manufacturing risks for any firm (SME or larger) may be generalizable into the following categories:

1) Legal risks, where the firm is exposed to litigation from suppliers and/or the supplier misuses the principal's confidential information (7, 35),
2) Quality risks, where the manufacturing agent either deliberately or unintentionally underperforms (7, 35), and
3) Financial risks, these are associated with the principal-agent problem and the management of cash flow (5, 7).

However, the significance of the consequences of these risks might be different depending on the size of the firm. Sinha (2011), who's research focussed specifically on mSME's, supports confirms that these findings hold true for mSMEs that outsource their manufacturing (36). However, Sinha (2011) expands on them to include:

1. Financial risks (36), the SME may incur additional costs as it is required to:
    a. Spend time (and, thus, money) employing various risk management strategies for outsourced manufacturing, and
    b. Travel to a remote manufacturing facility.
2. An over-dependence on suppliers and a loss of internal capabilities (36). Associated with the loss of internal capabilities is a perceived decline in innovation capacity at the principal firm. A loss of internal capabilities links to quality risks and an over dependence on a particular supplier may lead to legal or financial consequences.

While all efforts have been made to present supply side risks in a concise manner, the depth of these risks should not be underestimated. Literature goes to great lengths in examining what causes each risk, the best management strategy for each risk and the potential effect they would have on a firm. The strategies for managing these risks are expanded upon at the end of Section 2.4.

2.4 RISK MANAGEMENT

Examining what "management" means provides a platform for understanding what risk management is. Manage is a verb that describes the ability to handle or direct with a degree of skill: such as to exercise supervisory direction (37). In this context, management refers to the ability of a firm to manage the outcomes associated with the risks they are exposed too, when outsourcing their manufacturing, and bringing them to an acceptable level through the pre-emptive application of specific strategies. Further expanding on this, risk management can be defined as (26):

"An organized method for identifying and measuring risk and for selecting, developing, and implementing options for the handling of risk." (26, p.134)

To state it differently, an enterprise would engage in risk management activities in order to reduce the quantifiable loss, probability, speed, frequency and/or exposure to negative future realities. Thus, leading to an increase in the value of the enterprise (5). Successful risk management has the potential to increase business value and profits by reducing/minimizing costs associated with the consequence of risk (28). It will help an SME identify risks that might threaten its existence in time for it to deal with them effectively (8). Thus, this should be of primary importance to a firm in general and an mSME in specific to engage in risk management activities.

The scope of this research is focused upon locally outsourced manufacturing (as defined previously), however, there is a trend in the existing literature which suggests that companies may outsource manufacturing globally in order to gain strategic benefits, from the global manufacturing firm, such as massive economies of scale or innovation (4, 38). The American Department of Defence (2001) has neatly outlined the process involved in managing risk (Figure 2) (26, p. 134):

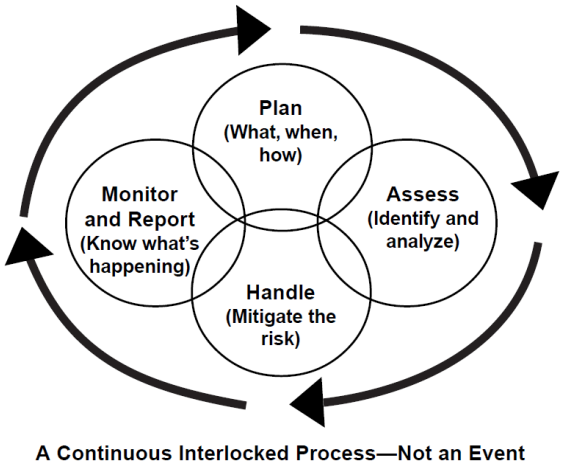


Figure 2: Four process of managing risk (26, p. 134)

Integrating this methodology with the preceding knowledge allows for the beginnings of the framework (which is one of the primary goals of this research) to take form. The steps of this process are expanded upon below. The diagram illustrates how this should be a continuous process and is non-linear in nature. It has been demonstrated that risk management processes in SMEs are can be both formal or informal in nature (28). This is most likely due to the different backgrounds of the owner managers which influences their approach to risk management.

This method is confirmed by Verbano and Venturini (2013) who refine it for business applications (28). They state first step (Plan) needs to be done in context with the strategic business goals of the firm. During this planning phase, it is suggested that the business determine what the maximum financial loss it can tolerate is (39). This threshold value allows for the consequences of the identified risks to be baselined. Also, the business should form a team who it can trust in the assessment and identification of risks it might be exposed to as opposed to a single person (i.e. the owner manager) (39). A team will allow for multiple views on a single topic, providing a sense of clarity that is difficult to achieve in isolation.

The second (Assess), must identify all the relevant risks the firm is exposed to as well as determine the expected probability of occurrence and consequence. This stage incorporates an aspect of the risk propensity of the firm's management. This risk propensity speaks to the subjective nature of risk (as discussed in section 2.3). To assist in identification of the risks, it is suggested that the business/assembled team examine its value chain, separate primary and support activity (39), examine the financial statements of the company and review all the business assets, activities and staff (8). Suggested tools to assist in the identification process are:

Structured brainstorming, Strengths Weaknesses Opportunities and Threats analysis and Task analysis (39). These risks should be ascribed values for the two characteristics (consequence and probability of occurrence). The consequence, where possible, should be quantified to a financial impact/loss. Risks can then be ranked in importance to the firm based off this information (low, moderate or high risk) (8). Risk identification is the prerequisite for application of risk management strategies and should be carried out continuously and systematically (8).

The third step (Handle), involves the application of the selected risk management techniques given the identified risks. These strategies should bring the "rating" of the risks to within a predefined and acceptable levels (28). Finally, the entire process must be continually monitored as risk, by its very nature, changes over time and, hence, any risk management framework will be inherently iterative and require constant revision. An important aspect for a business is to document the entire process. Important information to be captured is the contextual information, risk register, the decided plan for implementation and a brief summary (39). This research is focused upon two specific steps in the process, namely: "Assess" and "Handle". The American Department of Defence (2001) states that the management techniques can be generalised into the following categories and that the goal of all techniques is to reduce risk to an acceptable level:

1) Risk avoidance, a risk's rating is reduced by reducing or eliminating its probability of occurrence (26),
2) Risk control, a risk is reduced to an acceptable level through the use of deliberate process intervention (26),
3) Risk assumption, a risk is deliberately accepted as either one/or both of its characteristics are acceptably low (26), and
4) Risk transfer, this involves reducing a risk by shifting it to a lower risk section of a product (26). Alternatively, Sunjka and Emwanu (2015) states that the liability could be transferred to a third party (i.e. insurance) (21).

These categories allow for the high-level classification of risk management strategies.

It has been suggested that the risks associated with local outsourcing are easier to manage than offshore risks (35). Typically, the different forms of risk (Expanded upon in Section 2.3) require different strategies to manage them. Aron *et al* (2005) suggest that strategies for each type of risk are not interchangeable and their application may, in fact, increase the probability of other types of risk occurring (7). They ascribe a major reason for the occurrence of intentional risks, by the agent, to their activities being unobservable by the principal.

Table 3: Risk management strategies

Item	Category of risk management	Management strategy
1	Risk avoidance	Vertical "chunckification" (7), Trade off risk for performance of manufactured goods (26).
2	Risk control	Horizontal "chunckification" (7), Monitoring and coaching (7), Quality control (7), Prototyping, reviews and testing (26).
3	Risk assumption	Carrying sufficient inventory levels or Just-in-time inventory (3), Budget and schedule reserves (26), Supplier relationships (8).
4	Risk transfer	Pay an agent to assume risk through contractual means (i.e. warranties, insurance, etc.) (26).

Table 3 briefly summarises and associates the specific risk management strategies identified in literature to the category of risk management. Supplier selection can also form a type of risk management strategy where correct management of the relationship may mitigate risk to a significant degree (8). Relationships within a supply chain in South Africa has been identified as a significant contributor to successful risk management for SMEs (21). Henschel (2010) argues that for any risk management strategy to work, it must be integrated by the SME into its business planning and must be accepted by the workforce/employees as adding value rather than simply more workload (31).

Each category of management strategy may be effectively applied to the supply side risks mentioned previously. The owner-manager of an mSME would select and apply the category and strategy he/she decides would be the most appropriate to the type of risk (financial, quality, legal or over dependence on a supplier). This decision having been fed by their process (formal or informal) and heavily influenced by their individual experiences/background.

2.5 CONCLUSION

This literature review has covered the information on outsourcing, risk and risk management that is relevant to the topic of this research. Outsourcing has been described as the externalising of business functions by the principal. The reasons a firm might outsource may include outsourcing to reduce the average unit cost of the

function or to seek external capabilities and innovation from the agent. These motives are exclusive of one another and would lead to a different mix of risks that the principal is exposed to. The principal can outsource primary functions, support functions or those considered as non-core. Outsourcing may present some negative aspects which balance out the benefits. One such negative aspect is the increased complexity of the supply chain. Outsourcing may occur at different levels (tactical, strategic and transformational) and to different degrees. The decision to outsource is fed by transaction cost theory and is essentially a make versus buy decision. When this decision is made, a key aspect is supplier selection and the quality of the relationship between the principal and manufacturing agent. This knowledge forms the anchor for this research report and development of the conceptual framework.

Following this, risk is examined. It is noted the vast breadth and depth of the topic and that risk is pervasive in all forms of business and business activities. Risk is defined and is identified as having two main characteristics: probability and consequence of occurrence. Risk is in a constant state of flux and the values ascribed to its characteristics change over time. These values are, in SMEs, heavily influenced by the owner-manager's perception. This speaks to the subjective nature of risk. Risk was then discussed in general with the three root causes identified (Opportunity, uncertainty and hazard based risks). This was then narrowed down to the major risks that SMEs are exposed to, followed by a discussion of supply side risk. Outsourced manufacturing risks are predominantly composed of supply side risk. The major risks an SME is exposed to when engaging in outsourced manufacturing was grouped into three categories (Financial, Quality, Legal).

Risk management is the process a business would follow to manage the negative outcomes associated with risk. It follows a four-step procedure where this research is specifically interested in the second two steps (asses and handle). It is noted that this should be a continuous business activity as risk changes over time. Risk management strategies fall into four categories (avoidance, control, assumption and transfer). The incorrect application of strategy may, in fact, heighten the risk. The quality of the relationship between the principal and agent has been shown to have a major influence on the management of risk.

There is a significant quantity of material available on each major theme (outsourcing, risk and risk management) but very little on the combination of topics (the focus area of this research) in the South African context. Thus, this research seeks to apply this knowledge to a local context.

2.6 CONCEPTUAL FRAMEWORK

Given the preceding literature review, the conceptual framework for this research can be depicted in the manner given in Figure 3 below. The image depicts the flow of material and goods from the agent to the principal (the flow of information in the opposite direction is not illustrated). Associated with the flow of

goods is risk that is inherent to the outsourced manufacturing process and, flowing from the principal to the agent, is some form of risk management (which is the key focus of this research).

The dashed boarder represents the environment of the study. This environment consists of the mSME (or Principal) and the manufacturing agent, to whom the principal gets manufactured goods from. This research is aimed at the interaction between the manufacturing agent and the principal. Of specific interest are the supply side risks that occur between the agent and the principal. These are termed "Outsourced manufacturing risk" in the illustration. The different forms of these risks are described in the literature review. While inherent to the flow of goods, these risks have been depicted as being introduced to the flow of goods after they have left the agent. This was done to highlight the risks as a separate entity in this research. In reality, these risks are deeply entwined with the flow of goods and originate within the agent.

The risk management portion of the illustration (the highlighted oval) is based upon the idea that the principal would perform the risk management strategy (outlined in the literature review) relevant to the form of risk/s identified. These actions would be performed upon the agent and it is the responsibility of the mSME to initiate them. The management of these risks is of critical importance to the principal as it affects his downstream performance based on the type of risk: late delivery, poor quality, etc. (as outlined in the literature review).

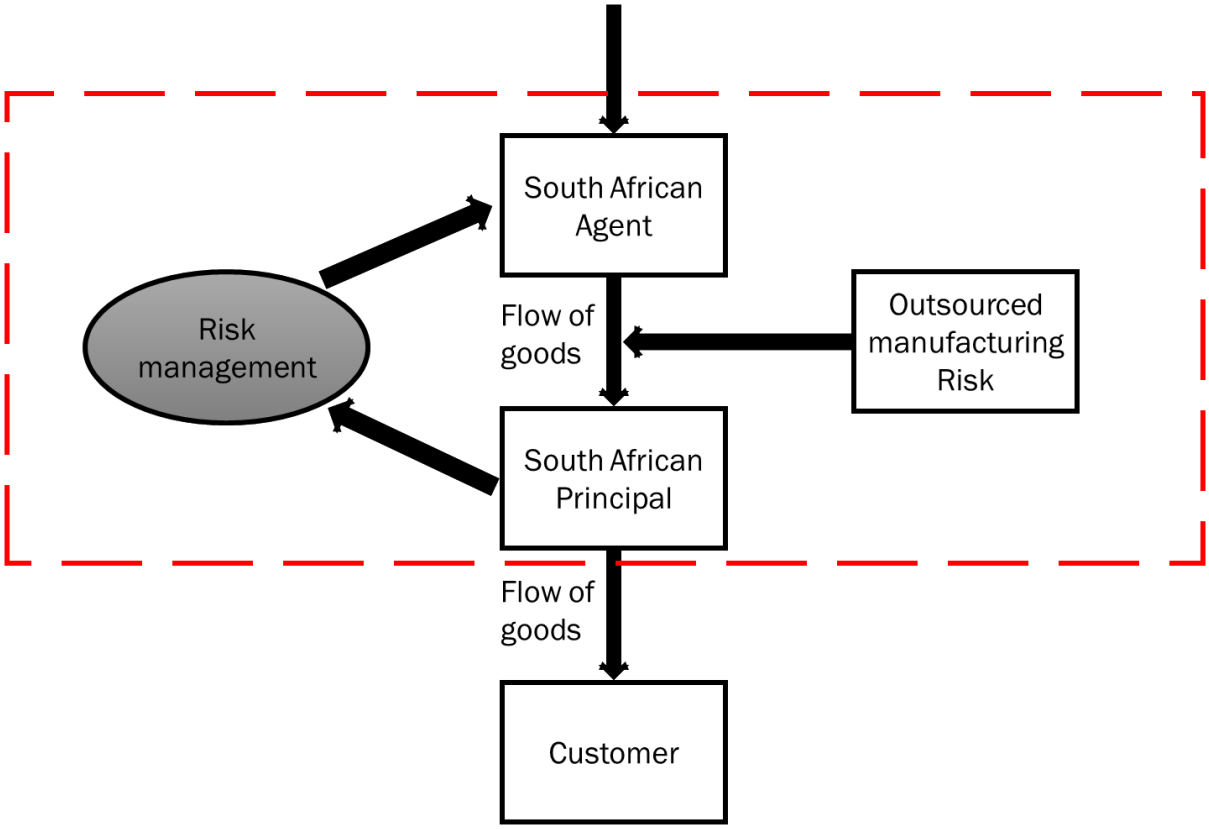


Figure 3: Conceptual framework (by author)

CHAPTER 3 RESEARCH METHODS

3.1 RESEARCH DESIGN

This study sought to develop a framework to assist SME owner-managers in assessing and managing the risks associated with the outsourcing of some or all of their manufacturing operations. This framework will attempt to illustrate, through both graphical and written description, the series of concepts relevant to this study. The framework will indicate how these concepts are presumed to relate to one another (48). The purpose of the framework is to attempt to present, in a succinct manner, what it is this research is examining, where are the boundaries of this research and what is perceived to be occurring within these boundaries (48). According to Mason (2012), it is expected that the framework will not be fully applicable to all of the collected data as this is an inherent limitation (48). The graphic representation of the framework will be developed through the idea of "concept mapping" which is described by Mason (2012) (48). This method is recommended when developing a visual representation of research, but it is important to note that every map will be incomplete when compared to the complex nature of the real life application. The generally accepted method for representation is too use circles or boxes to label concepts and arrows or lines connecting various boxes to represent relationships (48).

To create a holistic view of the topic of outsourcing risk in SMEs, a detailed study of literature was undertaken as well as a series of semi structured interviews with owner managers of firms that fit the required criteria (specified in Section 6.2). Following the completion of these two steps, the results were critically evaluated through codification, thematic analysis and descriptive statistics. Conclusions were then drawn with regards to the CRQ. Last, a framework was developed, based off the accumulated information, to guide industry on the best practices for managing the risks identified when a firm engages in local outsourced manufacturing in South Africa. The framework of best practices (for the management of risk) has been set out in a form that the layman can understand and apply in order to promote a risk management culture in industry. Thus, presenting practical knowledge that may serve to enhance the South African economy.

Thematic analysis was selected over alternatives (such as grounded theory and case study approaches, among others) because it allows the researcher to analyse themes and patterns within the data which then informs the theory (50). The need to solicit the views from multiple owner-managers of SMEs implied that a case study was not appropriate. Additionally, the limited sample size (four companies) meant that full saturation of data was not possible and, hence, a grounded theory approach was not suitable (50).

This development process is illustrated in the figure below. The circular arrows in the centre are intended to demonstrate that, when the final half of the research commenced, it was expected that new literature would

need to be investigated. This built upon the conceptual framework and enhanced the understanding emerging from the interviews and was iterative.

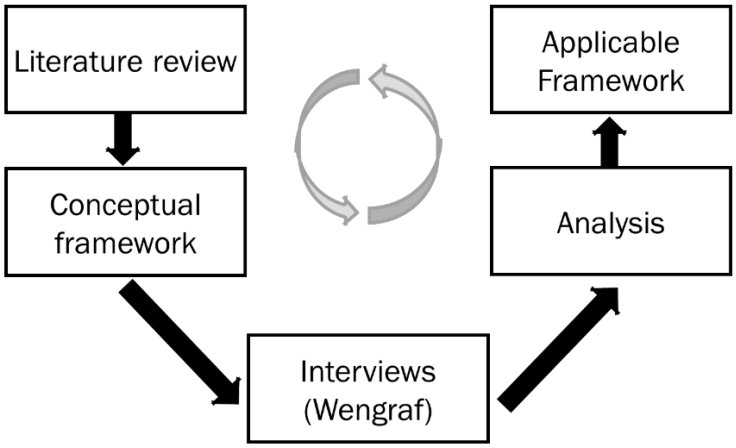


Figure 4: Research process (by author)

3.2 SAMPLING

Leedy and Ormrod (2019) state that (40):

> "The quality of the data obtained can only be as good as the quality of the sample(s) used." (40, p. 270)

The key is selecting a sample that can provide the required information. In the instance of this research report, the criteria of selection for participation in the interview/questionnaire process were:

a) The participant must be from a South African SME, selected based on the criteria specified in the National Small Enterprise Act No. 29 (2003) of South Africa,
b) The participants firm must outsource some or all of their manufactured goods to South African manufacturers,
c) The participant must have first-hand knowledge/experience in the topic (i.e. directly involved in the activity at their respective firms), and
d) SME's that fall within the standard industrial classification (SIC) system subdivisions for the manufacturing sector and qualify for membership to, or be a member of, the Steel and Engineering Industries Federation of South Africa (24, 25).

In Addition to these selection criteria, an SME in South Africa is classified as per the table given in Section 2.2. This method allows for the selection of respondents based on above criteria. This is termed 'purposive sampling'. Ideally, the sub type of purposive sampling will be expert sampling as the goal of this research is to capture industry knowledge on the topic (49). These qualifying criteria effectively bound the research. As the intended result of this research is to assist mSMEs, the participating firms must be mSMEs themselves.

Participants were selected who were available and willing to participate (convenience sampling within purposive sampling) as well as being selected based on the above criteria. They were identified through industry federations/groups (i.e. SEIFSA, 22 on Sloane, The Manufacturing Circle, etc.). However, this meant that the research was exposed to volunteer bias (40). Thus, any correlations found within the data was carefully examined for prejudice. The aim during the interview process was to achieve a saturation point, which wold mitigate the possibility of non-generalizable results and the lack of statistically relevant sample size (which is less relevant for the nature of this research). Saturation point is where additional interviews yield no new information (41). This is, generally, expected after 2 to 10 interviews with experts (42)**.** However, for the sake of completeness, this research conducted a minimum of 4 interviews with experts**.**

3.3 INSTRUMENTATION

This research used semi-structured interviews as they are considered an appropriate method when trying to elicit the perceptions of the interviewee (43) and allows for the interviewer to further probe the respondent's answers (42). This allows for answers to be clarified, discussion points to be explored and any inconsistencies removed (42). The interview structure was developed through the techniques presented by Wengraf (2000) (10). The researcher personally conducted the interviews and recordings were made with a portable audio recorder. These recording were then transcribed and analysed. However, the first step in the process was to develop a conceptual framework from the existing literature on effective risk management techniques for SME's engaging in local outsourced manufacturing as this provided a platform for the generation of relevant theory questions and, subsequently, interview questions. The literature review was conducted using the resources available at the University of the Witwatersrand's libraries as well as a search through various online repositories of research.

The interview schedule was developed off the pyramid model suggested by Wengraf (2000) (9). This is illustrated in the figure below.

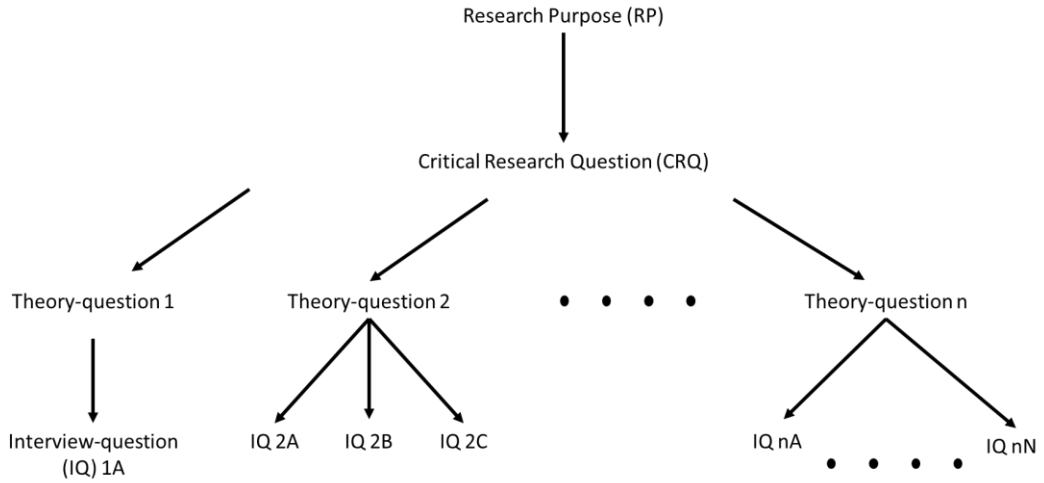


Figure 5: Pyramid model (9)

In this model, the research purpose can be linked to Section 1.2: Problem Statement/Motivation and the critical research question is given in Section 1.3. Wengraf (2000) proposes that the CRQ be described with between three (3) and seven (7) theory question (9). Based off these theory questions and knowing what type of person is to be interviewed, a set of interview questions are developed. These questions are phrased in the language that is common to the interviewee. Barriball (1994) expands on this to say that, when designing the interview schedule, care must be taken to avoid leading questions but given an interviewees potential response, probing follow-up questions should be prepared (42).

The interview schedule is provided in Appendix B, the interviews followed the structure below:

1. The interviewee was asked to provide some background about the company they own/manage.
2. The interview followed the skeleton as follows:
    a. **Theory-question 1:** What are the perceived benefits of local, outsourced manufacturing?
        i. **IQ1:** Why do you outsource your manufacturing?
        ii. **IQ2:** What benefits do you think your company gets through outsourcing your manufacturing?
    b. **Theory-question 2:** What are the risks that local mSME's are exposed to when the outsource some, or all, of their manufacturing?
        i. **IQ3:** How would you define what risk is?
        ii. **IQ4:** What are some of the problems you deal with when you outsource your manufacturing?
        iii. **IQ5:** Which of these do you think are the most important to keep your eye on (how would you rank them)?

c. **Theory-question 3:** What risk management strategies do mSME's employ when engaging in local, outsourced manufacturing?
    i. **IQ6:** How do you deal with these problems (identified previously)?
    ii. **IQ7:** If the ranking of the problem changes, how would your approach in dealing with them change?
    iii. **IQ8:** Would a framework combining industries best practices and literature be of any help to you?

Theory question one (1) attempts to uncover the benefits and reasons why an mSME would outsource its manufacturing. Theory question two (2) delves into the risks and problems that an mSME experiences if they follow this path. Theory question three (3) attempts to extract how a mSME manages the various risks identified in theory question two (2).

3.4 DATA COLLECTION AND ANALYSIS PROCEDURES

The data for this report was collected through two principal methods. First, a literature review to develop the conceptual framework. Second was the interview process. The participants were selected based on the criteria listed in Sampling section above. As the author of this report is an active industry player in outsourced manufacturing, care was taken to ensure the results were not biased by his own opinions/experiences. In addition, care was taken in identifying any participant bias during the course of the interviews. Drawing from the methods used by Manuj (2008) three steps were adhered too in preventing researcher bias (38). First, all the current knowledge of the researcher was listed and recorded in order to highlight any pre-conceived ideas (See Appendix A) and to keep these ideas away for the research. Second, journal-keeping during the course of the research allowed for recording of personal views and, again, assisted in keeping these views from influencing the research. Last, all results and findings are supported with quotes from the interview process and/or literature. The use of semi-structured interviews reduces the chance of the interviewee providing socially desirable answers to the questions (42).

The interviews were conducted in English and at a time and location that suited the interviewee. This was at the interviewees place of work for three of the interviews and at a local coffee shop for the fourth. The interviews were audio tapped and transcribed (in MS word) by the author. Following this, the interviewees where sent the interview transcripts and afforded the opportunity to review them, clarify points or request amendments. The interviews were, subsequently, coded (in MS Excel). This was to facilitate the content analysis and descriptive stats process. On average, the interviews lasted between 30 and 45 minutes.

The qualitative data was examined using thematic analysis methods, where data was coded and, subsequently, condensed according to themes (allowing for the extraction of key ideas) and analysed for similarities and

differences. Following this, conclusions/theories were generated (9). This analysis technique allows for textual data to be transformed into standardised information sets (44). There are no well-defined rules for developing the codes, they are often generated through researcher insight into the topic. However, there are styles of code generation which are generally classifiable into two categories, namely: Deductive coding and Inductive coding (44). Deductive coding would be based off the conceptual framework developed through the literature review (for this research), where the categories and codes are developed prior to the interviews. Inductive coding allows for the categories and codes to arise from the interview process. The research made use of a hybrid method where codes were developed prior to the interview process but, additional codes were allowed to emerge when the data sets were analysed. The analysed data, and codes, were then linked to theory questions (and, hence, the critical research question). In addition to this analysis method, the results were examined using descriptive statistics in order to describe any patterns that arise from the interviews (45). Following this, the industry applicable framework was developed. One of the challenges that coding presents is that words and sentences can, often, have multiple interpretations. This can affect the reliability of the research (44) but this was addressed through the nature of semi-structured interviews where the interviewee can be probed for clarity.

Figure 6 below illustrates the preliminary deductive codes as well as the associated themes and, finally, which theory-question they are linked to. The codes were derived from the information gathered during the literature review process.

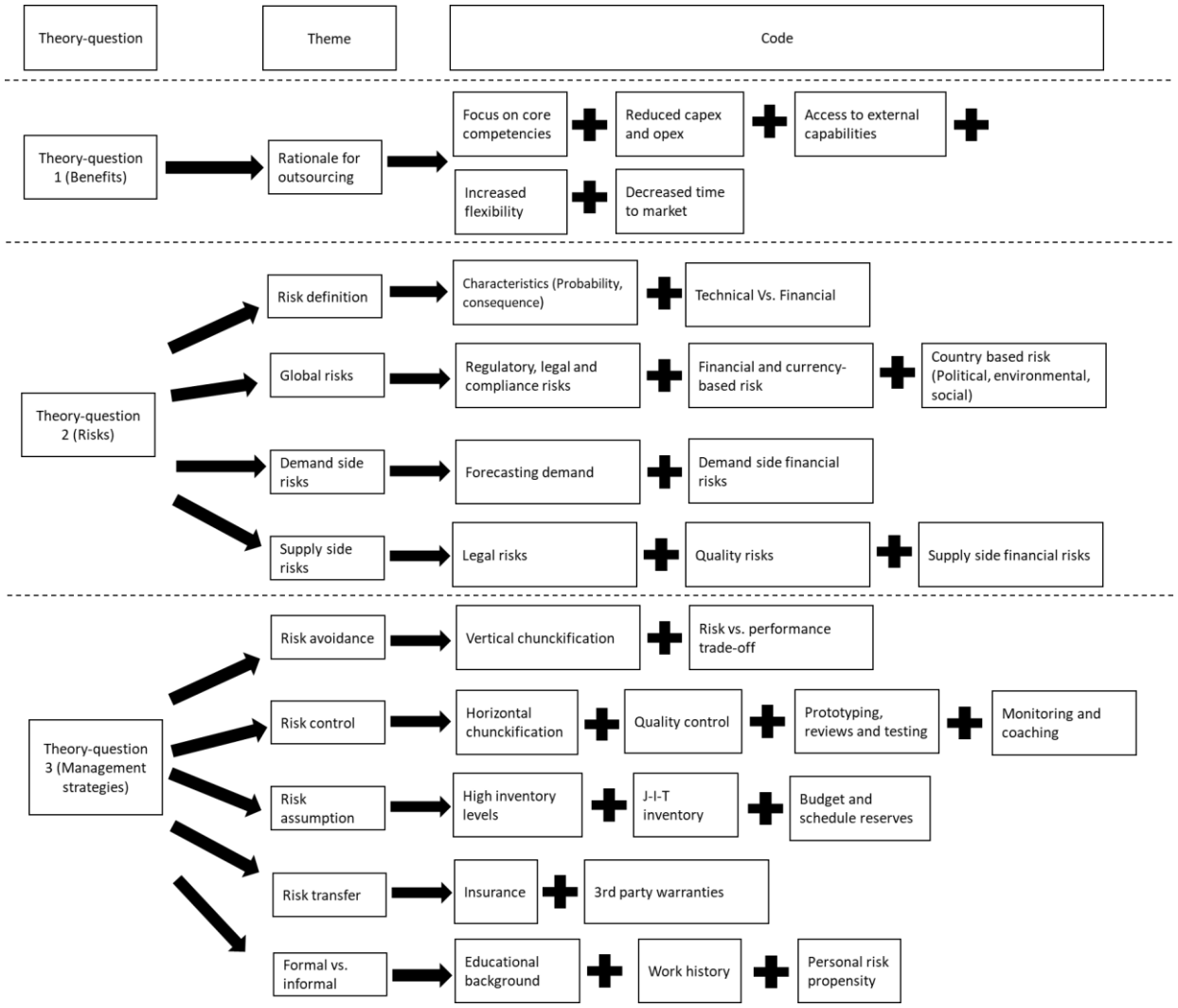


Figure 6: Preliminary Deductive codes (by author)

The ethics clearance number for this research is MIAEC 166/19.

In accordance to the School of Mechanical, Industrial and Aeronautical Engineering's ethics requirements, the interviewees were sent a copy of the participant information sheet prior to the interview as well as given a hard copy before the interview commenced (an example of which can be found in Appendix C). The interviewees were requested to sign a consent form before the interview (an example of which can be found in Appendix D). The signed copies are kept by the author in a project file relevant to this study. The audio files and transcriptions are stored in a password protected folder; whose password is only known by the author.

A state of quasi-saturation was reached. The generic benefits, risks and risk management strategies reached saturation but for obvious reasons, the questions unique to the individual business, did not reach saturation.

For example: how each owner-manager approached risk management was unique and did, therefore, not reach saturation. There were, however, common threads through all the different risk management processes which was expected. There were some emergent codes, but these were common for all interviews and, thus, saturation was reached within the expected number of interviews.

3.5 RELIABILITY AND VALIDITY

Golafshani (2003) identified reliability as being defined as whether a result is replicable and validity as whether the means of measurement are accurate and measure what was intended (43). He goes further to identify that in qualitative research, the two concepts are so closely entwined that the key question is:

"How to test or maximize the validity and as a result the reliability of a qualitative study?" (43, p. 602)

One proposed method is to use triangulation to ensure validity of results. This was one of the methods used in this study. It involves verifying results/conclusions from multiple independent sources. In this research, the sources were the information gathered from literature and the information extracted from interviewees. Further to this, Barriball (1994) (42) suggests that when using semi structured interviews as the data collection tool, it is important for the interview schedule to be administered in the same sequence and that each question must convey the same meaning to the interviewee regardless of the actual words used (i.e. wording must be appropriate to the type of person being interviewed). Standardising and documenting this (through the use of audio taping) method assists in supporting the credibility of the research. Semi structured interviews allow for the interviewer to evaluate the non-verbal cues of the interviewee which enhances the validity of the answers. The interview schedule was exposed to an expert who judged its appropriateness and completeness (prior to administration of the first interview). This is important as Leung (2015) refers to these two characteristics as being key in proving validity in qualitative research. In addition, he recommends examining the entire approach, starting with the choice of research question and ending with examining whether or not the conclusions are valid for the sample and context as well as documenting each step to provide an audit trail (46). This method for ensuring validity was followed over the course of the research. As mentioned previously, the interviews were recorded and, later, transcribed. This allowed for verbatim quotes to be used in the analysis of the interviews. This further enhancing the validity of the results (42).

Generalisability is not an expected attribute of this research as it is focussed upon a very specific set of businesses that reside in a specific geographical location (South Africa) (46).

CHAPTER 4 RESULTS

This section describes the results that have emerged from the data collection process. They are presented through the use of descriptive statistics as well as qualitative content analysis. The data collected from the interviews is anonymised in order to preserve the integrity of the interviewees.

4.1 DESCRIPTION OF COMPANIES INTERVIEWED

Four (4) interviews were conducted across a broad spectrum of industries that all fulfilled the requirements set out in the Research Methods section. Each company is described below.

Company A is involved in both the manufacture of mechanical and electrical products. Their manufactured goods are medium to highly complex in terms of product complexity. They serve a niche market within the mining sector and, predominantly, market goods that they have designed and produced themselves. The company focuses on intellectual property (IP) generation and outsourced the majority of their manufactured goods to local companies. Company A, while being an mSME, does engage in offshored manufacturing practices for certain goods. They also deal in "soft systems", that being control system, data bases and complete software solutions. Company A is a small firm when categorised according to annual turnover according to the National Small Business Amendment Act No.29 (2003).

Company B is predominantly an electronics company. Similar too Company A, they serve a niche market, however, their client base resides in the transport and rail industry. Company B markets a mixture of imported technologies and products that they own the IP for. Their manufactured goods are highly complex in terms of product complexity. Company B engages in local outsourced manufacturing practices as well as offshore manufacturing. They predominantly offer electronic solutions (both hardware and software) but are moving more into the mechanical domain. Both companies A and B consider that themselves as providing "best-in-class" technologies in their respective markets. Company B is a very small firm when categorised according to annual turnover to the National Small Business Amendment Act No.29 (2003).

Company C developed a mechanical system that served a niche in the transport industry but, in recent years, has come under threat from new entrants who are able to provide similar systems, based off relatively simple electronic components, that offers similar functionality. Their manufactured goods are of a medium complexity. Company C's products are a mix between their own IP as well as "off-the-shelf" items. Their products were predominantly mechanical in nature but they are moving towards a mixture of mechanical and electronic systems. Company C is a small firm when categorised according to annual turnover to the National Small Business Amendment Act No.29 (2003).

Company D provides purely mechanical systems. Their products are supplied into a market that is large when compared to Companies A, B and C but it could still be considered niche. Their products are less technologically advanced when compared to companies A, B and C and their advantage in the market is more "capability driven" as opposed to IP driven. This, naturally, implies that their products are relatively simple in terms of product complexity. In contrast to the previous companies, they in-house the majority of their manufacturing with only roughly twenty (20) percent being outsourced to local manufacturers. Company D has, when compared to the other companies, the largest facility and installed capital equipment. Company C is a medium size firm when categorised according the National Small Business Amendment Act No.29 (2003).

At all four (4) companies, the interviews were conducted with the owner-manager. Company C is owned and managed by two (2) individuals, the interview was a joint effort with both of them sitting in and answering the questions together. Companies B, C & D have all been in existence for more than five (5) years while Company A is the youngest at only two (2) years of age. The size categorisation is in respect to the National Small Business Amendment Act No.29 (2003) (23). This information is summarised in the table below:

Table 4: Summary of Company information

Company	**Age (Years)**	**Product complexity**	**Outsourced manufacturing**	**Degree of outsourcing**	**Size categorisation**
A	2	High	Local and Offshore	+90%	Small
B	9	High	Local and Offshore	+90%	Very small
C	+10	Medium to high	Local	+60%	Small
D	+10	Low	Local	+20	Medium

It is interesting to note that the majority of the mSME's that were approached to be participants in this study declined as they in house the manufacturing of their products.

4.2 THEMATIC ANALYSIS AND RESULTS

Themes were identified deductively according to Figure 6 in chapter 3.4. The graphs shown in the results present the codes relevant to each theme and frequency of each code. The frequency indicates how many discrete times the code was spoken about; this gives an indication of the relative importance of the code.

Theme 1 – Rationale for outsourcing manufacturing to local agents (aligns to TQ1)

The first portion of the interviews focussed on what are the perceived benefits gained by an mSME through local outsourced manufacturing. This theme revolves around the rationale for outsourcing. It answers the question: Why would an mSME outsource their manufacturing? It is of note to point out that none of the interviewee's mentioned, or spoke about, receiving "increased flexibility" as a benefit of outsourcing. However, most owner-managers inferred that an mSME in South Africa requires a certain degree of agility in the market that must be inherent to the firm. The owner manager of Company D stated that it is difficult for an mSME to achieve the required amount of attention when dealing with large agents.

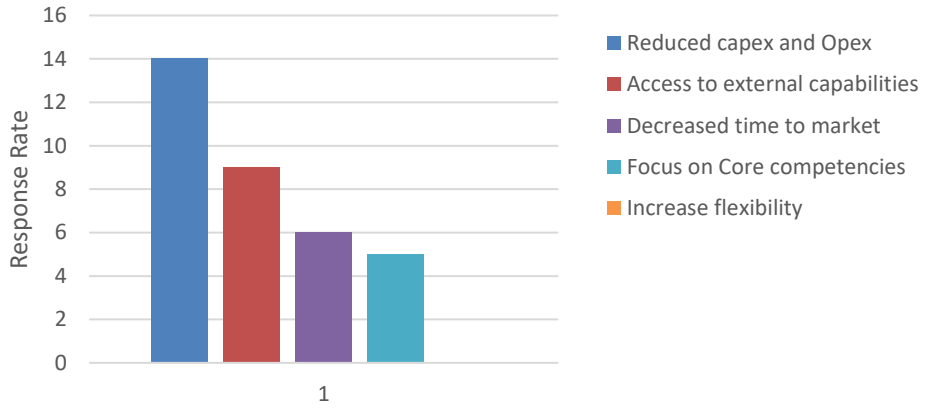


Figure 7: Response rates for Theme 1 (by author)

There was one deviant case in this theme. Company D indicated that they perform long term studies on the items that they outsource and, more often than not, they make the decision to in-source with the owner of Company D stating:

"We have gone the opposite route of most people." and *"from an outsourcing point of view, we have an aversion to it unless we cannot make it ourselves."* (Personal interview with Owner-Manager of Company D, October 2, 2019; unreferenced).

The activities that each firm outsources is summarised in the table below. The table also presents the degree to which the firm outsources its manufacturing as well as the level. While Companies A, B, and C outsource their manufacturing to a high degree, they all retain the internal capability for producing proof-of-concept or prototype equipment. All of the firms outsource with a long-term view at a strategic level.

Table 5: Outsourcing characteristics of mSMEs

Company	A	B	C	D
Product	Stock control and precision dispensing solutions	Precision measurement equipment and Internet of things solutions	Protection systems for industrial equipment	Sheet metal assemblies for the building industry
Product type	Electronic and Mechanical	Electronic and Mechanical	Electronic or Mechanical	Mechanical
Degree (%)	<90	<90	<90	=20
Level	Strategic	Strategic	Strategic	Strategic

A topic covered in the interviews which is not represented in the figure is the owner-mangers perception of manufacturing as a non-core activity. Companies A & B, which manufacture high complexity products, both stated that they consider manufacturing as a non-core activity. Where core activities were considered those activities that contribute to the competitive advantage of the company. Companies C and D, which manufacture low to medium complexity products, both consider manufacturing as core to their business. However, company D was the only one that in-housed a large percentage of their manufacturing. Company C has strategically decided to outsource a primary business function that they believe gives them a competitive advantage.

In line with this, Company A stated that while the manufacturing in and of itself does not provide them with a competitive advantage, the extremely short turn-around times they can achieve through the relationship with their supplier does. This is because the rapid manufacturing time allows them to outperform the competitors (both large and small). Thus, implying that one of their key competitive advantages is a decreased time to market. The first three companies all cited that they believed their product volumes were not high enough to justify the increased capital and operational expenditure required to in-house the work. This speaks to the owner-manager's decision related to the transaction cost of in housing manufacturing versus outsourcing it.

Only Companies C and D mentioned negative aspects with regards to outsourced manufacturing, where the owner-manager of company C felt it is easier to control manufacturing when it is in-housed as it is less complex. Company D tends to in-house work after subjecting the outsourcing decision to a form of transaction cost analysis where they feel they can manufacture good more efficiently and effectively in-house when

compared to external companies. The negative aspect of this decision includes a judgement on the higher operational costs, higher risk and additional personnel.

All four (4) of the interviewed companies highlighted that they source external manufacturing agents in order to gain access to the capabilities of the agents, this is the major reason for deciding to outsource. In the words of the owner-manager of Company B:

"By outsourcing it we can get the best partner that focusses on that manufacturing portion and you get all the benefits. You get the best machines, the best workmanship, the best quality." (Personal interview with Owner-Manager of Company B, August 31, 2019; unreferenced).

Three of the four companies (3/4) interviewed believed that by outsourcing the manufacturing they can achieve faster speed to market. In particular, the two companies with complex products believe that, for these complex products, overseas partners are often faster than local agents. Companies A, B and C weighted the reduction in capital and operational expenditure as being a primary reason for outsourcing their manufacturing. In addition, they rely heavily on the manufacturing capabilities of the supplier but not on their innovation capacity. The owner manager of Company D referred to this as "capability driven outsourcing". Companies A, B and C do the design and development work (innovation activities) themselves but rely on the suppliers manufacturing capabilities in the sense that they expect the manufacturer to suggest design changes with respect to optimising items for manufacturing and practical insight.

Companies A and B both engage in local outsourced manufacturing as well offshoring of their manufacturing. Companies C and D only engage in local outsourced manufacturing. Company C demonstrated an awareness of the benefits that off-shoring might bring but do not believe their production volumes are high enough to realise them.

All of the interviewed firms stressed the importance of having a good relationship with the supplier to whom they outsource their manufacturing to. Companies A and B validated each other by stating that a key characteristic of this relationship is a mutual sense of trust. Company A relied heavily on a supplier's previous performance when selecting a supplier for a new job. Additional considerations mentioned by the Owner-manager of Company B was that they look for a supplier who can offer them best-in-class manufacturing capabilities as well as one with an extensive supplier network.

Theme 2 – Risks associated with local outsourced manufacturing (aligns with TQ2)

The second theme sought to elicit the owner-manages understanding of risk and the specific risks they face when engaging in local outsourced manufacturing. This is critical for the management of risks as the first step

outlined in the risk management process (See Figure 2, Section 2.4) is to identify the particular risks you are exposed too. This knowledge allows for the application of the correct management strategy.

Definition of risk

When asked how they define risk, each owner manager gave an answer that contained unique aspects as well as underlying themes that were common. They all viewed risk as having a technical/engineering aspect to it as well as a financial element. Each owner-manager emphasised these two (2) aspects differently. Interestingly, the shift away from technical and towards financial moved sequentially down from companies A to D. This is stylised in the figure below. The actual emphasis will not follow such a straight line and is significantly more blurred. This shift away from technical and towards financial emphasis is linked in a shift from complex products to simple products respectively.

The owner managers of Companies A, B and D do view risk in light of the two characteristics, probability of occurrence and severity of consequence, but do not have a formal method of quantifying these risks. They apply a qualitative set of criteria but do often quantify the consequence into financial terms. All four (4) companies mentioned that the risks they are exposed to change depending on the nature of the manufactured product and the supplier selected to do the work. This change occurs on a per product, environment or client basis. Thus, the converse is true where the risks are similar within product types, environments and clients. They all view risk as being in a state of flux.

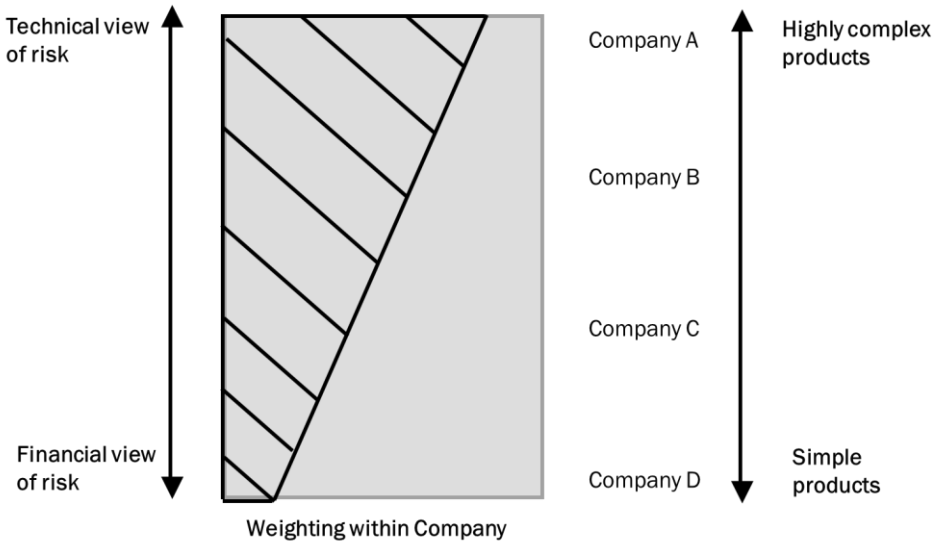


Figure 8: Risk rating within Company (by author)

Types of risks

As expected, none on the interviewee's mentioned global risks which, according to the conceptual framework outlined in the literature review, lies outside of the environment in which local outsourced manufacturing occurs. Figure 9, below, indicates the various codes associated with this theme and the frequency of each code.

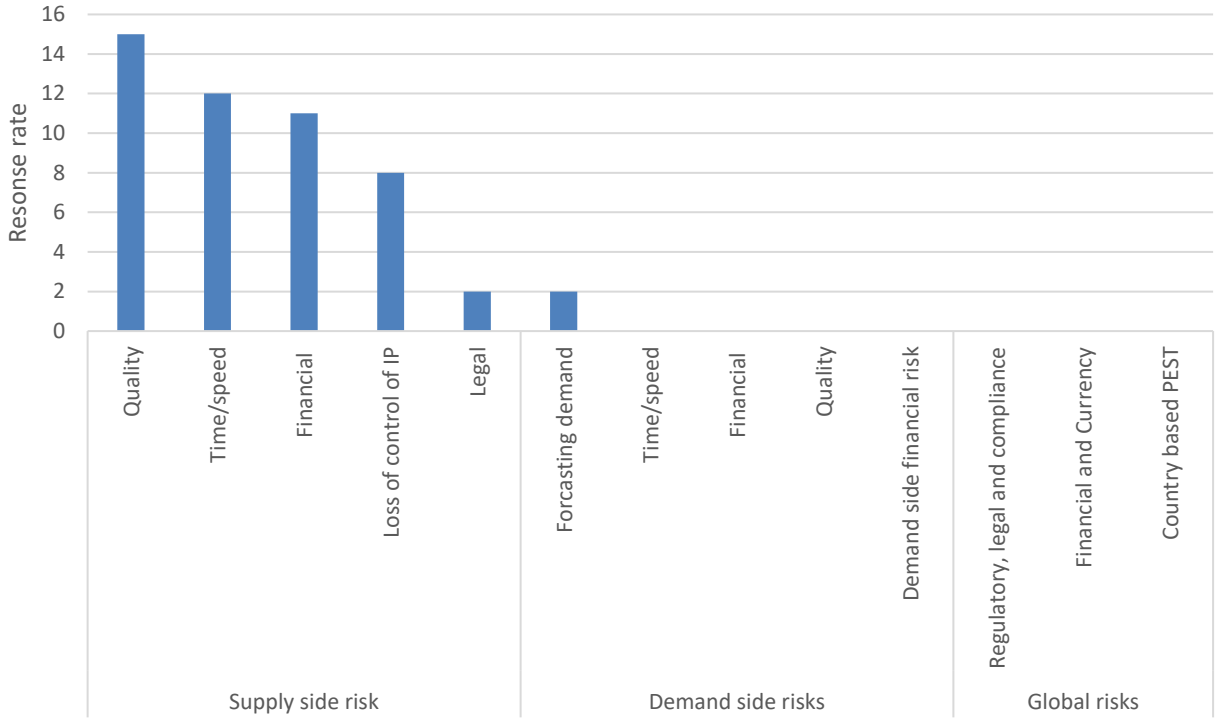


Figure 9: Response rates for Theme 2 (by author)

The definition of each form of risk, given below, is a synthesis from the answers given by the various owner-managers.

Quality risks refer to any deviation of the manufactured product relative to an expected specification. This deviation may be intentional or unintentional. This specification is not always formally captured but may be realised through an expectation of the work previously supplied by the agent. Below the bar of a product that is exactly according to the expected specification is the notion of a product that achieves a minimum functional specification. In this instance, the product is in a state that will be functionally acceptable by the client. The quality problem does not require the product to be re-worked or scrapped and remanufactured, but the issue will be corrected in subsequent work. All four of the companies attempt to manufacture goods at the highest possible quality relative to an acceptable unit price they have defined for the item. The consequence of this risk depended on the severity of the defect. As mentioned previously, there are three decisions to make if a quality issue is detected: Accept the product as is, rework the product or scrap and remanufacture. Each of these has a financial cost associated to it that increases as the list progresses. The severity of the defect and

the rectification plan may impact the delivery schedule which would lead to reputational damage for the mSME.

Time/speed risk, in the case of outsourced manufacturing, refers to any event that may adversely impact the delivery schedule. Delivery schedule is an aspect of Company A's competitive advantage where they feel that, because of the quality of the relationship with their supplier, they are able to manufacture goods significantly faster than their competitors. This speed is a defining characteristic of the company's value proposition in the sector they serve. The realisation of this type of risk will have, in a similar vein to quality, a financial impact as well as potential reputational damage. However, the financial impact may not be driven through rework costs (as is the case with a quality risk) but rather through an increase in overheads associated with the management resources assigned, by the principal, to rectify the issue.

Financial risks refer to manufacturing risks that affect the cash flow of the principal. The cause of these risks varies and can include when a customer does not honour the payment terms so the principal (or mSME in this case) has to carry the financial burden of late payment. Company B viewed financial risks through the lens of sustainability, where they believe there is a higher financial risk for their company on projects that offer once off solutions as opposed to a larger projected sales quantity. Financial risks may also be a result of poor demand forecasting by the principal.

Loss of control of intellectual property (IP) occurs when a principal develops the intellectual property around a product in the form of blueprints, drawings, specifications, know-how, etc and hands this property over to the manufacturing agent. The most severe consequence arising from this form of risk would be if the agent uses it for nefarious purposes. Such purposes could be selling it to their opposition or using it for himself and starting a company that competes with the principal. Generation of IP is viewed as one of Companies A and B's core activities. Thus, managing this risk is critical for them. Company D, who's products are relatively simple, do not rank this as a high-risk item as their products are capability driven as opposed to IP driven.

Legal risks where not well defined by the owner-managers beyond the fact that, while they all agree on creating contractual agreements with manufacturing agents, the cost of litigation and enforcing these contracts negates their value to an mSME.

Company C and D both mentioned demand side risk as something they pay attention to. Demand forecasting, practically, results in the principal manufacturing goods without having purchase orders placed at the time of manufacture. Both firms attempt to forecast their demand one month in advance and feed this information back into their manufacturing system. Both owner-managers recognise that should you forecast incorrectly one of two future realities will occur. These are either you will end up with too much stock if you "over forecast" which will negatively affect your cash flow or you run the possibility of "under forecasting" and

having too little stock which means you cannot invoice to the maximum amount for the month which, again, negatively effects your cash flow. This negative aspect is balanced against the positive, that being: they can negotiate preferential rates with their suppliers and can fulfil orders immediately which improves their industry image. Forecasting only one month ahead would limit the effect the consequence of this risk to a single month's cash flow.

Should the principal view the agent as being the originator of a risk or negative outcome, this will affect the agent's probability of being selected as a supplier for future work.

Risk Exposure

All four (4) companies felt they had some level of exposure to "loss of control of IP", it was definitely of a higher order in companies A and B which develop the most sophisticated products. Company C felt they had some exposure to this form of risk. "Time/speed" emerged after the first interview (with Company A). This risk is applicable to the entire process before the manufactured product reaches the customer. Only companies A and B found time/speed and quality risks to be of a higher order the financial risks. This is supported by the owner-manager of company A:

"*The two (2) biggest (viz. risks) are meeting the spec and then the time commitments, then outside of that is the cost because you know up front."* (Personal interview with Owner-Manager of Company A, August 30, 2019; unreferenced).

All four (4) companies mentioned quality risks as a risk that they monitor. Companies A, B & C appeared to focus more on this than Company D. All the companies engage in quality control processes. This takes the form of in-process quality control at the manufacturing agent as well as acceptance testing, where applicable, when products are delivered.

In terms of financial risk, it was interesting to note that companies A, B & C have a view that it is subordinate to time/speed and quality. All four firms equate the consequence of each risk into financial terms where applicable. Companies D placed a significantly higher emphasis on financial risks. Company C did emphasis it more than A and B. to quote the owner manager of Company C:

"Sometimes you need to sacrificed price so that you get the right quality. It's not always about price, price is key, but it's not always about price." (Personal interview with Owner-Manager of Company C, September 27, 2019; unreferenced).

The mSMEs interviewed all place a heavy reliance on the manufacturing agent for the identification of risks that might affect the manufacturing process. This reliance is built on the relationship between the agent and principal. Linked to this identification is "communication". The method and frequency of communication between the principal and agent needs to be correct and changes depending on the maturity of the relationship.

Theme 3 – Risk Management Strategies practiced by mSME's (Aligns with TQ3)

The previous two themes focussed on the benefits an mSME would gain if they chose to outsource their manufacturing and the potential risks they may be exposed too. This next theme answers the question: How would an mSME manage the risks identified in theme 2? This would allow them to reduce (or eliminate) the consequence or probability of the risk. In general, all risk management strategies can be grouped into the categories listed in the literature review (Table 3, Section 2.4), these are: Risk avoidance, Risk control, Risk assumption and Risk transfer. Within each category are multiple management strategies. This is captured in Figure 10.

This section of the interview contained the largest quantity of information. This is evident by the size of the graph below which indicates the frequency of the responses for each question.

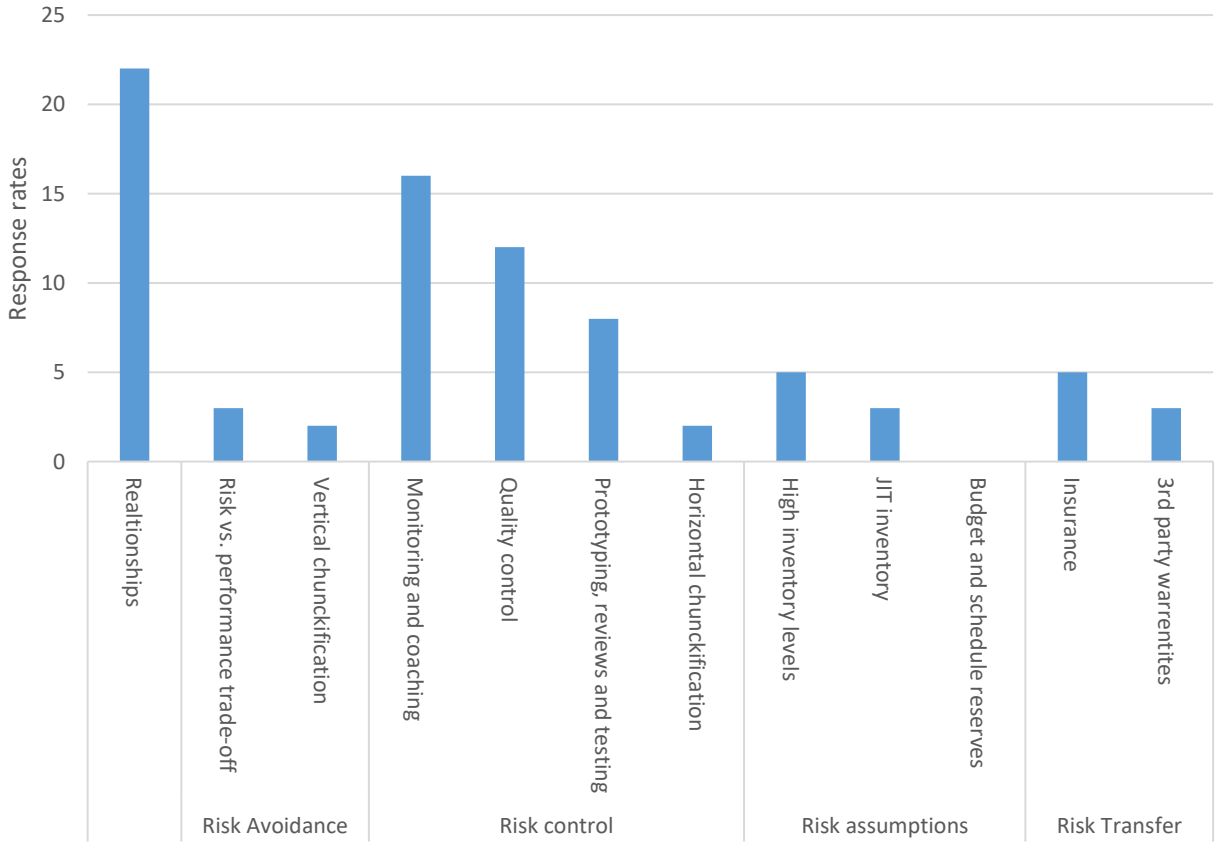


Figure 10: Response rates for theme 3 (by author)

A form of risk assumption, which is termed "Budget and Schedule" reserves, was not mentioned by a single owner-manager as a method of risk management. An inductive code, in this theme, is the concept "relationships" and how it affects risk management. As is evident in Figure 10 the relationship between the principal and agent was spoken about in great detail and length. All four (4) of the companies spoke about this concept. It has not been included in one of the four (4) overarching risk management strategies as it has aspects that tie into each category. To quote the owner manager from company C:

"We have chosen to go on both the electrical and mechanical side with a small company where we have a very good relationship … This is why the supply chain works very well." (Personal interview with Owner-Manager of Company C, September 27, 2019; unreferenced).

The length of the relationships between the principal and agent varied greatly with no apparent indicator. The upper and lower limit ranged from three (3) months to upwards of thirty (30) years with the median resting around ten (10) years. The sample size for this information is not-representative of the population as it is not of significant size, thus it is not generalisable, but hypotheses can be postulated. The owner-manager of Company A views the relationship as the primary means of effecting any risk management strategy.

In terms of risk avoidance, three (3) of the four (4) companies interviewed mentioned that they make use of "risk vs performance trade off" when engaging in outsourced manufacturing. Company D stated that this is the first aspect they consider when they are planning to engage in outsourced manufacturing, with the owner-manager stating:

"I define it in terms of: Do we need it or can we do without it?" (Personal interview with Owner-Manager of Company D, October 2, 2019; unreferenced).

All four of the firms practice vertical "chunkification". This is when a product (in this instance) is split in to multiple, non-overlapping subcomponents. These subcomponents are then sent to different manufacturers. This is done to preserve the integrity of the principals IP.

Risk control, and all of its subcategories, are fully utilised by all owner-managers. During the site visits too Company C and D, it was noted that they have the most extensive in housing quality control capabilities as opposed to companies A and B (which produce the most complex goods). In particular, Company C had the most sophisticated quality control processes. All the owner-manages mentioned that, when there is a quality issue at the manufacturing agent, they rely primarily on the agent for identifying it and notifying them timeously. The relationship between the principal and agent allows for the principal to trust the agent in performing this function. In addition, the relationship is one of the key factors related to the successful resolution/rectification of the problem as quickly and amicably as possible.

This relationship also allows for them to get deeply involved in the agent's processes and facility which allows for monitoring and coaching as well as issue rectification. Also, if the problems are catastrophic, Company A and C mentioned have alternate suppliers as a risk management strategy. They both acknowledge that this alternate supplier will manufacture the product at a premium price but view this added financial burden as being worth it when compared to a late delivery and the ramification that would have. These ramifications manifest themselves in the relationship between the principal and end client/customer.

The concept of "Prototyping, reviews and testing" as a risk control method is practiced by all of the mSME owner-mangers that were interviewed. This was surprising as it has an associated cost to it which, it was assumed, mSME's would avoid. However, in interpreting the responses from the owner-managers, it would appear that the prototypes are all developed to a functional state with the intention of selling the first units and, thus, recovering some of the expenses.

All of the mSME owner-mangers interviewed engaged in varying degrees of "monitoring and coaching". This is to:

1) Monitor the agents manufacturing process to allow for early identification of production issues,
2) Coach improvements to the agents manufacturing process or internal quality control, and
3) Monitor the agents stock levels to ensure sufficient supply of goods is on hand.

There was not an emphasis on monitoring the agent for misuse of confidential information. Horizontal "chunkification" is a risk management strategy that is used to mitigate/prevent opportunistic renegotiation and shirking by the agent. This was practiced to some degree by the firms that were interviewed. Most of the mSMEs interviewed lean heavily towards single sourcing procurement which should increase the likelihood of these risks occurring. However, they rely on the trust-based relationship to manage these as opposed to horizontal "chunkification".

All of the owner-mangers interviewed practice some combination of high-inventory levels and Just-In-Time (JIT) inventory management. Companies C and D seem to have slightly more sophisticated inventory management systems and forecast their demand one (1) to two (2) months in advance. There was also an expression of balancing the amount of stock you carry versus your available cash flow. It was interesting to note that while Company C forecasts their demand one (1) to two (2) months in advance, they try to give their agent a forecast for twelve (12) months as this allows them to fix their input costs for a twelve-month period. In terms of cash flow, Companies C and D both made mention of the fact that they have accounts open with their suppliers. This allows them to sell the manufactured goods, prior to the account being due, easing the financial burden on the company.

A surprising find was that all of the owner-mangers interviewed thought that legal protection/agreements between them and their agents were of little value. The general expression was that the costs and time associated with legal recourse is prohibitive for an mSME. In addition, a delay in manufacturing, caused by legal processes, will lead to late delivery and reputational damage for the principal. There is consensus that it is better to rely on the "relationship" for managing any issues that would typically be handled by legal recourse. To quote the owner-manager of Company B:

"I do perform the legal paperwork, but I can say from experience that if you don't have the relationship, with trust and faith, the paperwork won't help you. From my experience in legal work it is extremely difficult to tie up the legal paperwork to ensure you have full protection. Therefore, it is more important that you build a relation and to have the relation both ways, not just one sided." (Personal interview with Owner-Manager of Company B, August 31, 2019; unreferenced).

Risk Management Process

The final questions are intertwined, where the participants were asked if their companies have a formalised risk management structure? To what extent their personal background has shaped how they approach risk management and if they think a framework would be of benefit?

First, none of the owner-mangers interviewed have a formalised risk management process/structure within their companies. The assessment of a risks characteristics is defined by the owner-manager; there is no team approach. Risk identification is performed in an informal manner but the consequence is often related to a financial impact. The maximum tolerable financial loss the firm can accept was not discussed or defined by the owner managers. The identification of risks during the manufacturing process is the responsibility of the agent but only because the principal has a trust-based relationship with him/her. Company B was the only one that mentioned in-depth processes reports during the manufacturing process. The selection of appropriate risk management strategies is primarily done by the owner-manager. There was little documented information available on risk management within the firms interviewed.

Companies B and C did have a typical "recipe" that they would follow during the outsourced manufacturing process. Both recipes rely heavily on communication with the agent (which is enabled by the relationship). Company B's method involved the following steps although it is fluid and project specific:

1) They attempt to issue as complete as possible manufacturing packs to the agent by performing thorough upfront engineering.
2) If possible, a prototype or pilot study is performed prior to product manufacturing.

3) Before the product is manufactured, they develop a set of quality control checks that the agent must conform too. This is one of their primary risk mitigation strategies.
4) For products on the more complex side of the spectrum they try to build "evolution" where the initial product has basic functionality and, once proven, they improve it in subsequent releases. (risk vs. performance trade off).
5) Communication is handled formally with the agent through feedback and progress reports. In addition to this, informal WhatsApp groups and skype conferences are regularly held. If the project is complex and/or the upfront specifications are not to the correct standard, they will send an engineering technologist to site on either semi-permanent or permanent basis, depending on the project. They, as far as practically possible, insert their management resources into the manufacturing process.

Company C places a heavy emphasis on the relationship with their agents. They rely on the relationship to ensure the agent gives early notification of quality issues and issues that may affect the delivery date of goods. In addition, Company C places a heavy emphasis on in process quality control as well as acceptance testing of items arriving from the supplier. Further to this, Company C and D emphasised the need for their staff to actively participate in risk management activities. Company D does not have a formalised structure to manage outsourced manufacturing risks but what they do formalise on is, first, the decision on whether they actually require the goods (risk avoidance), second, should the product be in housed or outsourced and, last, the on boarding requirements of agents (supplier selection). Some aspects examined during the supplier selection process are capability of the supplier, pricing, location and delivery schedules. The depth of the supplier selection criteria is a function of the complexity of the product being outsourced.

A key tenet to Companies C and D's management strategies is monitoring the inventory levels of their suppliers. This is to ensure that the principal can always fulfil customer orders by ensuring a sufficient supply of goods from the agent. Company D stressed the need to have a high quality relationship with the agent and that this relationship is key to any management strategies. All companies get involved in their agent's operations as far/deep as possible.

Company A did not have a recipe that they followed. However, there where general principles that are adhered to. First, there is a heavily reliance on the relationship, between the principle and agent, in managing risk. Second, early identification of risks is paramount as this allows for the principal to plan and correct the issues. This early notification is facilitated through the relationship and it will allow the principal to manage his/her client's expectations around any delays in delivery that may arise from the risk. Last, there are alternate suppliers who can assist in rectifying issues (at a premium price) if needed. The cost for rectification/resolution can be recovered through future sales.

Owner-manager profile

All of the owner-managers felt that their personal backgrounds and experiences has significantly influenced how they approach risk and risk management. This is evident in the varying definitions of risk as well as how they manage risk. Some of their traits are listed in the table below.

Table 6: Character traits of interviewees

Owner manager	A	B	C	D
Education level	Post-graduate qualification	Graduate qualification	Graduate qualification	Post-graduate qualification
Age (estimated years)	30-40	40-50	50-60	40-50
Work history	Large Corporate to mSME	Large Corporate to mSME	Entire career at SME size firms	Corporate to mSME

Feedback on the Framework

When discussing the framework that will be the product of this research, each owner-manager had important contributions for developing something that will be of benefit to mSMEs. The owner-manager of Company A felt that it would be of benefit in assisting new mSME owners by reducing the learning curve associated with managing the risks associated with outsourced manufacturing.

"It could be beneficial in bringing people up to speed on what the risks are for what they are trying to achieve." (Personal interview with Owner-Manager of Company A, August 30, 2019; unreferenced).

Both the owner-manager of Companies A and B mentioned that it cannot be a fully defined framework, it should be flexible and implemented as a guideline rather than rule. To quote the owner-manager from company B:

"I would make the risk model flexible, that you build a general structure but some of those items you allow for tailoring/configure." (Personal interview with Owner-Manager of Company B, August 31, 2019; unreferenced).

The owner-manager of company B mentioned that it should err more on the technical as opposed to the financial side of risk management for outsourced manufacturing. Another valuable input from him was that it should allow him to fast-track into a relationship with a new agent. The owner-manager of Company C mentioned that he thinks that, as their business sells unique and specialised products, the risks they are exposed

too are unique, so any frame work needs to be a guide only but it is up to the owner-manager to interpret and implement it as he/she sees fit. The owner-manager of Company D mentioned that he would prefer a more practical outcome from the research in the form of a training guide or set of training slides that he could use to educate his employees (and self) on the topic. He believes the end result needs to consider the adoption of the recommended strategies. Overall, the impression was that this would definitely be of benefit for the following reason:

"The industry/sector, it is in dire straits precisely because people don't understand the risk management part of their supply chain." (Personal interview with Owner-Manager of Company D, October 2, 2019; unreferenced).

4.3 VALIDITY AND RELIABILITY

The interviews were administered in the same sequence where possible but, as the interviews were semi-structured, there was some natural movement based on what the owner-manager wanted to discuss. There were continual attempts made to keep the interviews according to schedule. Questions where phrased in the perceived education level of the Owner Managers and, when required, the questions where explained further. In addition, notes were taken during the interview to allow for any non-verbal ques to be recorded. The interviews were audio tapped and transcribed (in MS word) by the author. Following this, the interviewees where sent the interview transcripts and afforded the opportunity to review them, clarify points or request amendments. These actions reduced the impact of researcher bias.

The interviews were, subsequently, coded (in MS Excel) and analysed. Unfortunately, a limitation of available resources prevented the codification process from being performed by multiple people. Following the first set of transcriptions, coding and analysis, the interview audio tapes were examined again. Any deviations where noted. Any relevant information that may have been excluded in the first pass was noted and included. Interviewee bias was avoided through asking open ended questions and by ensuring participants of their anonymity. This anonymity reduced the likelihood of the participant providing socially desirable answers. Furthermore, during the interview process, interviewee responses were probed and clarified in a judgement free manner (minimising socially desirable answers) and questions where phrased in a non-leading manner.

Last, were applicable, verbatim quotes were used during the presentation of the results to enhance the validity of the particular result.

CHAPTER 5 DISCUSSION

This section of the report contains the interpretation of the results section in light of the existing literature and emergent knowledge. The overall objective is to answer, in detail, the critical research question posed in Section 1.2. That being:

"How can a small and medium sized manufacturing enterprises effectively manage the various risks associated with local outsourced manufacturing within South Africa?"

The objectives for this research, being the foundation to answering the critical research question, have been achieved. First, a conceptual framework was developed and is illustrated in Section 2.6 of the literature review. This framework is deductive in nature as it was developed through an understanding of the preceding literature. Towards the end on this section, a new conceptual framework is given that combines the first attempt with the information gathered through the interview process. This is, thus, a combination of inductive and deductive information and should present a significantly more complete picture of the area of study. Second, the topic of this research was investigated through a series of semi-structured interviews carried out with owner-managers of mSME's in South Africa that locally outsourced some, or all, of their manufacturing.

The discussion is set up to follow the same sequence as the results section. This begins with a discussion on the perceived benefits an mSME would gain from engaging in local outsourced manufacturing followed by a discussion of the different risks they might expect to be exposed to, as well as, the various risk management strategies that the mSME's could implement to address each type of risk.

Theme 1 – Rationale for outsourcing manufacturing to local agents

Figure 7 (in the Results section) illustrates the relative importance of each benefit to the mSME's that were interviewed. The benefits of reduced capital and operational expenditure, access to external capabilities, and focus on core competencies align with the benefits presented in literature (6, 13, 14). The literature, however, points to "increase flexibility" as an additional key benefit which was not identified by the selected Owner-managers interviewed. The benefits the interviewed South African mSME's gain when engaging in outsourced manufacturing are, thus, similar to mSME's in other areas of the world. An emergent benefit is a decreased time to market. This benefit is unique when compared to the reviewed literature. It allows the principal to develop and manufacture goods at a rate that is faster than their competitors. The Owner-managers of companies A and B believe that this is driven by the demands of their customers. This benefit would lead to a competitive advantage in the South African market.

Balanced against these benefits are the major negative aspects which are a more complex supply chain and the cost of in housing the manufacturing. The complexity of the supply chain is noted by Akbari and Hopkins (2016) (11). This complexity will add to the transaction cost and is driven by the need for more intensive management resources to oversee the process. Contrary to the study of SMEs in Finland (16) it was found that the degree to which a function is outsourced did not dictate the severity of the consequence. For example: Company D, who outsourced to the least degree, outsourced components that were beyond their capabilities to manufacture and are critical to their products. There may be a weak link in correlating the motive and degree of outsourcing but this study was too limited in scope to do this.

The first unexpected result was that none of the mSME's stated that engaging in outsourced manufacturing allows them to gain increased flexibility as mentioned by Quelin and Duhamel (2003) (6) and Kumari (2015) (13). This is listed as a zero response in Figure 7. However, it is postulated that flexibility, which is defined as the ability of a firm to adapt easily to different scenarios (33), is part of the same family as "agility" and that agility is a defining characteristic of the modern day mSME. To quote the owner-manager of company D when discussing this:

"SMES without that agility don't survive" (Personal interview with Owner-Manager of Company D, October 2, 2019; unreferenced).

This is then a trait of the principal and does not form one of the benefits that they would seek when outsourcing manufacturing. Thus, it may be inferred that agility in the principle is required for the selected South African mSMEs in order to successfully outsource manufacturing. This agility is influenced by the buying power of the agent. As suggested by the owner manager of company D, an mSME might enhance its "agility" if it works with agents that are SMEs as this will level the playing field and allow for the principal to command the correct/desired amount of attention. An alternate explanation for this could be that, as the literature reviewed focusses on mSME's in non-South African countries that are from predominantly first world nations, the inherent need for the principal to be agile is a dominant trait of South African (or emerging economy) mSME's due to the differences in the markets in which they operate. In confirmation with Akbari and Hopkins (2016) (11), South African SMEs (inclusive of mSMEs) predominantly outsource at a strategic level.

All of the mSME's interviewed do not partner with manufacturers to enhance their ability to innovate on a product level, rather they pursue partners who can innovate on the manufacturing level. An example of this would be Company B, who outsource the manufacturing of their work to firms who can advise and select the best possible components to manufacture the product. Further to this, the selected SMEs place a high weighting on the low-cost manufacturing capability of the agents during the supplier selection phase. This affirms the research by Lars (2009) (4), in a South African context, which found that firms typically pursue

low-cost or innovation motivated outsourcing separately. However, care must be taken in assuming generalisations due to the limited number of participants of this study.

The decision to outsource is based on transaction costs. When Company D examined the transaction cost of outsourced manufacturing, they tended to in-house as opposed to outsource. This is evident by the fact that they only outsource twenty (20) percent of their manufacturing. The factors that negated the perceived benefits of outsourcing for company D were: the relatively high staff compliment, extensive facilities, relatively high product through put (and associated cash flow), low product complexity and high internal capabilities.

Therefore, when examined, it is evident that they would tend to in-house as opposed to outsource. They believe that the manufacturing activity can be performed more efficiently in-house. This decision to in-house as opposed to outsource manufacturing was not the focus area of the study and is not explored further.

Companies A, B and C all believed their product volumes did not justify in-housing their manufacturing. The key factor for in-housing as opposed to outsourcing is perceived to be dependent on the complexity of the products that a company develops as well as the financial side (product volumes, margins, etc.). This was not explored in this research. However, it is evident that as products tend towards complexity, this factor becomes more significant as the capital required to purchase the specific equipment that manufactures complex products will be greater as well as the operational expenses such as a highly skilled workforce.

A core activity in an organisation is one that provides it with a competitive advantage (10, 11). As discussed in the introduction, being competitive is a necessary characteristic of an mSME. It was initially thought that mSME's core function would be the generation of intellectual property and that manufacturing would be secondary to that. This was confirmed with Companies A and B, which both develop highly complex products and had the view that the manufacturing is non-core and not a major contributing factor to their competitive edge. Both stated that the product/value proposition and, supporting the proposition, the generation of the intellectual property that allows them to develop best in class technology is core. However, Companies C and D (which both manufacture products on the lower end of the complexity spectrum) maintain that manufacturing is core to their operations and is a key factor that contributes to their overall competitive advantage.

It is evident that the selected mSMEs in South Africa do not conform with the notion that only non-core activities should or can be outsourced. Linking outsourcing to product complexity leads to the idea that as products become more sophisticated and complex, the principal's strategy shifts from achieving a competitive advantage through manufacturing to gaining a competitive advantage through intellectual property generation. Reinforcing this concept is that as products become more sophisticated and complex, there is a

need to access specialised (and, thus, expensive) external capabilities for the manufacturing of the goods (such as printed circuit board manufacturers, etc.).

The four main selection criteria for a manufacturing agent that were given in the literature review, namely: Availability, Reliability, Capabilities and Transaction cost, are confirmed as being valid in the selected South African mSME context. Specifically highlighted by all the owner managers was the transaction cost. In particular, there was a heavy emphasis on the relationship, between the principal and agent, and its effect on the transaction cost. As the relationship and trust between the agent and principal increases, the transaction cost decreases.

Theory question one (1) stated: What are the perceived benefits of local, outsourced manufacturing? The decision to outsource is driven by a conscious "make versus buy" decision. This decision is driven by transaction cost theory (intentionally or without the conscious knowledge of the owner-manager). The benefits that an mSME want to gain through outsourced manufacturing can be traced to the motive for outsourcing. The motive and sought-after benefits drive the level (i.e. strategic) and degree of outsourcing. Following this is a supplier selection process based of the desired benefits. These aspects of the theory question were confirmed with those found in literature and expanded upon (in the case of decreased time to market). Thus, validating and linking the available theory to practice in the South African context. Understanding these factors, for an mSME, is key as the risks they will be exposed to are dependent on them.

Theme 2 – Risks associated with local outsourced manufacturing

Each owner-manager had a unique definition of risk that is informed by the owner-managers personal background. These were also specific to the business that they run but all shared common themes. These individual views on risk confirms its subjective nature as suggested by Redmill (2002) (30). All the owner-mangers interviewed highlighted that risk contains two main aspects: a financial aspect and a technical aspect.

There was a general understanding of the two defining characteristics of risk namely: probability of occurrence and severity of consequence (26). Risk, in practice is not formally quantified against these two traits, but, rather, it is a more qualitative judgement by the owner-manager. The American Department of Defence (2001) (26) suggests a formal treatment of probability and severity of consequence as this would provide a more objective view which is beneficial. In line with literature (39), the consequence is generally equated to financial loss or reputational damage. The selected mSMEs treatment of risk is informal in nature and, while there is some agreement with literature (i.e. equating consequences to financial terms), there is a lack of knowledge transfer (or skills) with regards to the formal, objective approach to characterising risk. This informal treatment will lead to subjective views on risk which depends on the person defining it.

Figure 8 may be interpreted as implying that the emphasis on risk shifts from technical to financial as product complexity shifts from complex to simple (respectively). Highlighting this finding is important as there was no prior research that indicates this relationship between product complexity and a shifting view on risk for mSME's. It is, thus, a major finding and needs further investigation. The result of this finding should be able to provide a guide to mSME owner-mangers on which risks to focus on based on the perceived complexity of their products.

In addition, should the mSME initiate a second product line of differing product complexity, the owner-manager needs to be cognisant of the shift of the relative importance of financial versus technical risk. In agreement with Henschel (2010) (31), there was a level of sophistication in risk (and risk management) in the higher technology firms when compared to low technology firm (Company D). This was evident in the fact that Companies A, B and C all have intensive in-process and factory acceptance quality control procedures while company D performs simple factory acceptance testing on incoming goods. However, the understanding of risk and risk management is, in the firms interviewed for this study, dependant on the owner-manager as opposed to the level of product technology.

Types of Risk

The three major types of manufacturing risks explored in literature (namely: legal, quality and financial) are found in practice in the selected South African mSMEs. In addition, there is a fourth type of risk i.e. "time/speed" which is not explicitly dealt with in existing literature but was mentioned by the owner managers interviewed.

The potential for poor quality goods being received from the agent as well as the potential for late deliveries is thought of as more important than financial risks for Companies A, B and C. Company D viewed financial risks as being more important but still monitors quality and delivery schedule risks. However, considering the figure (Figure 8), this makes sense as company D, which manufactures relatively simple products, has a view of risk that is heavily weighted towards financial aspects. It is worth mentioning that companies A, B and C have a view that the costs of a product are fixed once manufacturing commences (and the order has been placed with the agent).

The importance of quality was strongly emphasised by all four (4) companies. This form of risk for mSME's was identified by Aron *et al* (2005) (7) and supported by Harland *et al* (2003) (35). When discussed, at that point, it was highlighted that this was typically due to underperformance by the agent. The outcome of this risk is that there is the potential of premature failures of the product in the field which would lead to reputational damage for the principal and/or a financial impact. This financial impact is due to the cost of the principal having to rectify the problem.

An interesting idea that emerged from the interviews was that the manufactured goods do not necessarily need to be perfect (100% according to specification) but that a "functional" state was acceptable should quality issues be identified in the manufacturing process. This allows the mSME to, potentially, still adhere to the promised delivery date with a functional product, assuming that any rework will affect the delivery date, which would prevent the reputational damage previously mentioned from occurring. In addition to that, the financial impact would be mitigated to some extent. This functional product would then be improved upon in subsequent deliveries/versions of the product. The Owner-managers of Company A and B provided three tactical responses when a quality issue is detected. The first is to accept the product as is, the second is to rework the existing product and last, the product may need to be scrapped entirely and re-manufactured. These three "levels" have increasing severity of consequence. It emerged from the interviews that these quality-based risks may be deliberate or unintentional. For example, a deliberate quality risk was present in a component manufactured for Company D where an agent was unable to produce the part due to a lack of the correct equipment.

The potential risk of "time/speed" which predominantly refers to delivery schedule is viewed in the same light as quality risks. Companies A, B and C emphasised it over financial risks while company D viewed financial risks as being more important. This risk has similar outcomes to quality risks. There is the potential for late deliveries which impacts the reputation of the principal and there are financial implications. However, these financial implications are related to the fact that reduced time frames (or increase speed) leads to a reduction in overheads and, hence, a reduction in the costs the principal assigns to the product. Thus, speed can improve the profitability of the individual manufactured item and reduce the potential for late delivery penalties. This idea of "time/speed" as a potential risk was not explicitly explored in literature and is an emergent theme for the data set. As literature was produced in predominantly first world countries, there is the potential for these countries to have developed the skills necessary to plan for on time deliveries with a high degree of accuracy. The South African economy, which is an emerging economy and has yet to mature with regards to this. To quote the owner-manager of company A when discussing this:

"We're not particularly good at planning as South Africans." (Personal interview with Owner-Manager of Company A, August 30, 2019; unreferenced).

Beyond poor planning, companies C and D mentioned that the time/speed risk can be a result of raw material supply issues, delays in the agents manufacturing process or delays due to rework of items (from quality faults). These risks have the same nett effect as mentioned previously. What is interesting to note is the cascade effect of a quality risk where it may lead to further time/speed risks.

As mentioned in the preceding text, companies A, B and C viewed quality and time/speed as superseding financial risks. However, all the interviewee's recognised financial risks and their potential negative impact on their businesses. One form of financial risk identified by Aron *et al* (2005) (7) is opportunistic renegotiation by the agent. None of the owner-managers interviewed mentioned opportunistic renegotiation as a risk that they are exposed to. Why this risk is not a factor for the selected mSME's in South Africa is because all the companies interviewed understood, to some extent, supplier selection and had some set of criteria to select a manufacturing agent. Part of this is that, typically, the agents they engage with are ones with whom they have long standing relationships. These relationships are built on trust and, hence, inherently disqualify agents that would be unethical (and engage in opportunistic renegotiation). The reason why this appears in international literature and not local literature could be the size/characteristics of the sample used in this research or it could point to the idea that mSMEs, in the countries where the international literature was produced, engage in a more transactional relationship with their respective agents as opposed to the trust based relationship which is found in the selected mSMEs in South Africa. This trust-based relationship will be explored, in detail, in the discussion on Theme 3 – Risk Management Strategies practiced by mSMEs.

As this study focused on the relationship between the agent and principal, who are both local South African companies, it was expected that global and demand side risks would not factor into the discussions. This was the case for companies A and B but not for Company C and D, both raising their demand forecasting as a risk that affects their manufacturing. Company A and B did not link their demand forecasting to manufacturing. This forecasting ability is linked to the products and markets that each company produces and serves respectively. The first two companies manufacture and sell complex products to niche markets. The current volumes are small and, when they do manufacture, it is only small batches that are client specific. The second two companies manufacture and sell products that are of a lower complexity. However, during the interviews, and examination of their products, it is apparent that their customer base is significantly larger. Thus, leading to a more stable and constant up-take of products. This affords them the opportunity to forecast their demand with some degree of accuracy. Both of these companies felt that this ability allows them to manage their cash flow. This clearly affects the financial risks between the principal and manufacturing agent.

The inability to forecast presents a financial risk where either the stock is too high (over estimating demand) or too little (under estimating demand). The consequence of this is that either cash is tied up in inventory or the mSME is unable to invoice to the maximum amount, as pointed out in the results section. Both companies A and B tend towards a Just-In-Time (JIT) inventory strategy. Just-In-Time inventory is a strategy where, briefly and simply, goods are received only as they are required (47). This reduces inventory costs and levels. Companies C and D tend towards a practice of advanced stock holding. This stock is, however, relatively conservative as they both keep stock for roughly one month ahead (which is linked to their demand forecasting). Both Owner managers believe it is difficult to forecast further than this, thus confirming what Sunjka and Emwanu (2015) (21) found in that demand forecasting in South Africa is difficult. This practice,

in both cases, can be linked to the type of manufactured goods each company produces and the markets that they serve. The primary characteristic, for an mSME, of the manufactured goods that would impact the stock holding position for mSME's is the relative cost of goods sold. In addition to this, if the product is customised per client/order, it would limit the ability of the principal to hold stock when compared to products that are more generic in nature (i.e. the products produced by Companies A and B versus those produced by Companies C and D, respectively). However, a limitation of this study was that the stock management decision and associated factors was not explored beyond a basic level of understanding. This needs to be further investigated in the future.

According to Figure 9, loss of control of intellectual property (IP) is the fourth most pertinent risk that owner managers of the selected mSME's are exposed to. All the companies are aware of it and take it into consideration. This risk was the only form of supply side legal risks that was raised by the owner-managers. Loss of control of IP was identified in international literature by Aron *et al* (2005) (7) and, thus, this finding is common between international and local mSMEs and is supported by literature. Litigation, however, between the principal and agent was not discussed by any of the owner-managers as a typical risk. Litigation between the principal and agent was not explored further but it is postulated that its apparent lack of attention is due to the high costs associated with legal action (which was confirmed during the interview process). The costs being a function of the cost of the legal team, loss of production while the action is ongoing and reputational damage due to potential late deliveries.

Theory-question 2 stated: What are the risks that local mSMEs are exposed to when they outsource some, or all, of their manufacturing? These have been explored and can be generalised into quality, time/speed, financial, demand forecasting and legal risks. The relative importance of these risks shifts as products move from sophisticated to simple. The characteristics of each risk (probability and severity of consequence) are determined in an informal manner that is subject to the owner-managers personal background. The consequence of each form of risk is typically equated to financial or reputational damage. This informal treatment within minimal to no available documentation goes against the methods prescribed in literature but, in practice, appears to be successful. An interesting development is the importance of "time/speed" risks. The reason for its occurrence is given previously but this risk is not explored in international literature and is, thus, assumed to be unique to the South African context. The risks a firm is exposed to are dependent on many things but includes the supplier selected as the agent and the motive for outsourcing. After these risks have been identified and characterised, the relevant risk management strategy can be applied to them. Their identification forms part of the risk management process and is discussed in the next section.

Theme 3 – Risk Management Strategies practiced by mSMEs

The results in this theme were expected to follow the same pattern as identified in literature, that being: risk avoidance, risk control, risk assumption and risk transfer. Following this, an examination of the risk management process performed in practice (by mSMEs) versus that provided by literature is presented.

"Relationships" formed a key topic with all the interviewed owner-managers. While not a risk management strategy per se, it forms the foundation of all risk management practices for the selected mSMEs in South Africa. It refers to the relationship between the principal and agent. These relationships are not purely transactional but tend towards a friendship (while not actually reaching that point). To quote the owner-manager from Company B:

"Just like friendships that you have, it's very similar in business, you need to develop and build that friendship. And you build that trust and faith, it's very important." (Personal interview with Owner-Manager of Company B, August 31, 2019; unreferenced).

The relationship is trust based and its strength increases over time. It has a major influence on the transaction cost. All the owner-managers interviewed, in varying degrees, support this idea. These relationships are the key enabler for successful risk management for South African mSMEs that locally outsource their manufacturing. This concept has previously been mentioned in South African literature. Sunjka and Emwanu (2015) referred to it as "the building of relationships" within an SMEs supply chain (21).

Literature reviewed on this topic did not make mention of legal protection for mSMEs engaging in outsourced manufacturing. The interviews support this idea as none of the owner-managers felt legal protection was beneficial, as a risk management strategy, to an mSME in South Africa. While it would serve to protect the mSME from agents misusing their confidential information and allow them to apply penalties for late deliveries or poor quality by the agent, it is not regarded as an effective risk management strategy. The reasons the selected South African owner managers shared for its ineffectiveness is that the costs in pursuing successful legal recourse are too high for an mSME. The proposed make up of these costs has been stated previously. The owner-managers interviewed would rather rely on the relationship they have with their agents in order to solve the problems (such as late deliveries, unacceptable quality, misuse of confidential information and financial irregularities) that legal recourse might have addressed. To quote the owner-manager of company A:

"As an SME my last port of call would be legal. So outside of the relationship there is not a hell of a lot you can do to save a project and throwing legal documentation backward and forward doesn't help anyone." Personal interview with Owner-Manager of Company A, August 30, 2019; unreferenced).

Budget and schedule reserves were mentioned in literature as a form of risk assumption that companies may use (26). None of the owner managers interviewed for this research mentioned that they engage in this practice. The reason for this contradiction could be that in South Africa, there is more pressure on mSME's to deliver within a shortened time frame as suggested by the owner manager of Company A. This would mean that the manufacturing project plans have already been compressed as far as possible and there is no available time for schedule reserves. This is a factor of the larger environment that mSME's operate within South Africa as well as a factor of the customer-principal relationship. In addition to these, as financial risks are a dominant risk for mSMEs, it implies their cash flow is constrained. What this implies is that there is no budget reserve available for managing risk through additional cash. Thus, budget and schedule reserves are not a viable option for South African mSMEs.

Both forms of risk avoidance identified in literature are practiced by the selected mSMEs in South Africa. Vertical "chunkification", which entails the splitting of a product into non-overlapping parts and sending each component to a different manufacturer, protects a company's intellectual property (IP) and is thus, only applicable to companies that generate IP. This applied to all four selected mSMEs. Company D, who does not consider its competitive advantage stemming from IP but rather capability, however, views loss of control of IP as a lower order risk.

Risk versus performance trade-offs were most heavily emphasised by Company B. This could be due to the fact that their electronic measurement systems are complex and they would rather implement a basic version of the system first and then, in the words of owner manager B, *"build evolution".* Company D, whose products are the least complex, also practices a form of this risk management strategy where the first step in their product development cycle is a question on components where they ask "*can we do without it?*". If the answer is yes, then it is excluded from the product. Thus, the risk vs. performance trade-off is not solely ascribed to product complexity as all four companies engage in it. It is incorporated into the design process prior to manufacturing and is a qualitative design about what the customer will accept as a minimum functional product.

Risk avoidance, while practiced by all the mSME's interviewed, is not a major risk management strategy as is evident by the frequency given in Figure 10. The cause for not making extensive use of vertical "chunkification" is, perhaps, due to the increased complexity of outsourcing as multiple agents are needed and are required to split up products into non-overlapping modules. This increased complexity would lead to higher transaction costs in the form of management resources. The strength of the relationship between the principal and agent would also factor into this. A stronger relationship would imply that there is a large amount of trust and, hence, the need to heavily protect IP is reduced. It is proposed that the reason why risk versus

performance trade-offs are not extensively used is due to the idea that the products that mSME's manufacture should only be designed to fulfil client functions and not have excessive functionality built into it. Thus there would be a minimal amount of performance that could be reduced/removed. However, while not a heavy focus point, risk avoidance is something that all the selected mSME owner-managers considered and must be included in any risk management strategy that an mSME employs. This confirms literature on risk management for outsourced manufacturing (7, 26) in the South African mSME space.

mSMEs engage in two forms of risk assumption. These were identified through the interview process as being "high inventory levels" and "Just-In-Time" (JIT). These both fall under the umbrella of inventory management. It was expected that none of the mSMEs would carry high inventory levels as they typically do not have large budget reserves as previously stated. Thus, the impact on their cash flow would be too pronounced. However, both Companies C and D carry a relatively high levels of stock. This is linked to their demand forecasting capabilities. They both carry stock for one (1) to two (2) months of operation. Clearly this would impact their cash flow (which is a risk). However, they weigh this against the ability to deliver products quickly and find it worth the risk. An interesting addition to this financial risk is that company C has the ability to link this too a twelve (12) month take-off projection with their manufacturers which allows their input costs to be fixed over an exceptionally long period. This allows them to be independent of currency, material and labour cost fluctuations but, inherent to this, it may have a negative effect depending on the overall movement of the factors. In addition, they both have 30 day accounts with their manufacturers (as opposed to cash on delivery purchasing) and attempt to sell and invoice products before the accounts are due which significantly reduces the burden on their cash flow. Companies C and D have the most advanced stock management systems, in addition to the points listed above, this may be a factor of the age and, hence, maturity, of the mSME.

Companies A and B practice JIT inventory management. It is reasoned that it is due to the high complexity of their products, associated product costs and relatively constrained cash flow, that they cannot carry inventory. Also factored into this decision is the demands of their sector/customers on what an acceptable delivery date is. In addition, their orders are typically small batches for specific clients as opposed to Companies C and D which sell relatively generic products. However, by not carrying stock, these two firms will be more exposed to delivery schedule risks where any mishap in their supply chain will influence their ability to deliver on time to the client.

Risk transfer through the use of insurance, 3rd party warranties (Sunjka and Emwanu (2015) (21)) and legal protection (The American Department of Defence (2001) (26)), while mentioned in literature, is not an effective means of risk management for the selected mSME's in South Africa. All the owner-managers believe that legal protection is not a valuable tool for their mSMEs. Companies A and B, however, still put contracts in place. The reason for this is mostly driven by the costs of legal recourse. In place of this, all the owner

managers would rather rely on the relationship they have with their manufacturing agents to resolve issues normally covered though legal protection. Those being a loss of control of intellectual property and misuse of confidential information.

The form of risk management that was discussed in the most detail and length was risk control. The selected South African mSME's engaging in outsourced manufacturing heavily weigh risk control and it can be considered the most important form of risk management for them. However, it would be unwise to consider all forms of risk management. Within risk control, there are four (4) sub-categories, namely; "Monitoring and coaching", "Quality control", "Prototyping, reviewing and testing", and "Horizontal chunkification."

The relative importance of each subcategory follows the same numbering sequence. All these forms of risk management were identified in the literature review (7, 26).

First, monitoring and coaching, which is actioned by all the owner-managers interviewed, is a risk management strategy that allows the principal to monitor the agent for potential delivery delays and quality issues as well as financial irregularities. Often, the principal relies on the agent for early notification of potential issues. This is facilitated through the relationship between the principal and the agent. In addition, the relationship allows for the principal to get involved in the agent's operations, thus, facilitating this strategy. All the owner-managers interviewed are willing, and often do, get involved in their agent's operations in improve quality and delivery schedule issues. Interestingly, literature pointed to the use of monitoring and coaching to identify misuse of confidential information or possible under performance. However, as mentioned previously, the owner-managers interviewed deal with these in different ways. Misuse of confidential information (or IP) is managed through vertical chunkification where necessary as well as the supplier on-boarding requirements which, inherently, requires a relationship based on trust between the principal and agent. Under performance, again, is managed through the quality of the relationship. Thus, the concept of "relationships" is a dominant force in the South African mSME space while not discussed on an international level.

Second, quality control has two aspects to it. The first is quality control while the manufactured part is still at the agent (in-process QA) and second is when the manufactured part arrives at the principal (factory acceptance testing). In the first case, monitoring by the principal is used to identify early quality issues as well as the agent notifying the principal directly. The key when the quality issue is identified at the agent is to resolve it timeously and amicably because it is in the best interest of the principal to ensure the delivery date is matched as close as possible in order to reduce or eliminate potential negative consequences. The early identification and resolution of the issue is heavily influenced by the quality of the relationship.

In addition, the concept of coaching comes into play here where the principal will get involved in the agent's operation in an attempt to improve their in-process quality control and to rectify the identified issue. It was surprising to note that, while Companies C and D are supposed to manufacture the simpler products, they both had the most extensive in-house quality control to check items arriving from the agent. In particular, Company C had an extremely rigorous quality control process. Companies A and B, which manufacture complex products, had minimal in-house testing facilities. This is due to the fact that as products become more complex, the equipment for testing them becomes more sophisticated and, thus, significantly more expensive. An mSME cannot afford this equipment due to their relatively constrained cash flow. In lieu of this, they rely heavily on the factory testing performed by the agent which, when described, appears to be rigorous. In addition, the extent of the in-house quality control does factor in the age of the mSME where the older mSME's have more extensive in-house quality control. All of the owner-managers' emphasis quality of their products with Companies A and B specifically offering "best in class" technologies. As discussed previously, some of the mSME's weigh quality over financial aspects of a project (within reason).

Third, prototyping, reviewing and testing is used by all of the mSMEs interviewed. This is used for all new products developed. As stated in the results section, when engaging in this, the mSMEs try to sell the prototype unit to recover some of the costs. What this form of risk management does is it allows the principal to reduce any quality problems before production begins on a new product. In addition, should the quality of the relationship between the principal and agent permit it, the agent will suggest production-based improvements to the product as well as suggestions based on previous experience with similar products. In terms of reviewing, Company B seemed to have the most advanced form when compared to the other owner-managers. This can only be ascribed to the background of the owner-manager as it is different to all the others. Where he has extensive training as a system engineer in a field where reviewing of work to date was mandatory. However, all the owner-managers do, to varying degrees, engage in reviewing products during the design, prototyping phase and production phases.

Last, horizontal "chunkification" is not used, in its traditional sense, where the principal has multiple agents manufacturing the same item and uses this to monitor variances in quality and cost. It is rather used as a last resort for exceptionally poor performance by the sole agent. In this instance, the principal would pay a premium to an alternate supplier to correct, or begin anew, what the original agent could not. The reason for it not being used in the traditional form is the perception of it making the supply chain more complex and, thus, diverting the principals already constrained resources to the management of multiple agents. As mentioned in Theme 2 of the discussion, opportunistic renegotiation was not mentioned by the owner-managers as a risk they are exposed too. It is postulated that this is mitigated to unimportance due to the quality of the relationship between the principal and agent which, when it is good, implies the likelihood of unethical behaviour by the agent is minimized.

Literature outlines a risk management process with four main steps that are interlinked and continuous. The steps are planning, assess, handle and monitor (26). This process is formal in nature with key actions that need to be performed at each stage (28, 39, 8). In practice, all of companies interviewed approach risk management in an informal manner. While this informal approach may not be in strict accordance to literature, it does bear good results. The owner-managers, in their own informal method, do perform each step (albeit modified).

During the planning phases, literature suggests that the firm quantifies the maximum financial loss it can tolerate in order to baseline consequences of risk (39). This function was not explicitly discussed in the interviews. However, it was implied as the owner-managers qualitatively assigned financial losses to the consequences of each risk's occurrence. In this step, literature suggests the principal create a team for performing the risk management process (39). This is not done in local mSMEs. Thus, this could be an area of improvement for South African mSMEs.

During the assessment phase, activities the principal must performs are identifying the risks and assigning values to its characteristics. To assist in identification, literature suggests an examination of the supply chain which would identify the supply side and raw material risks. This action is performed by industry in that supplier selection is a key factor as well as an understanding of raw material flow. An example of this is company C, who's agent receives custom aluminium profiles from a raw material supplier. They understand the criticality of this raw material and monitor it closely. Further to this, the manufacturing process is examined in terms of possible in-process quality control that would mitigate risk as well as provide feedback to the principal. However, the application of these processes is company specific and dependant on the owner-manager's understanding. This is an area that could be improved, through an objective set of criteria, for the selection of the correct identification method, relative to the risk profile and manufactured products. This would prevent the subjective application of methods. This subjectivity, in practice, rolls into the quantification of the characteristics of risk. This is heightened by the fact that none of the owner-managers have a team approach to this. Thus, the assessment phase in industry is an area that can be improved through a more systematic approach based on the differences between literature and practice. South African mSME's place great emphasis on the relationship between themselves and their agents. This relationship influences and plays a great role in risk identification.

The third step ("handle") is when the relevant risk management strategies are applied. These have been discussed previously. mSMEs in South Africa make use of a broad range of risk management strategies with a few exceptions. An example is that "budget and schedule reserves" is not used for reasons given previously. The identified risk needs to be linked to the correct management strategy. However, in general, the strategies used by mSMEs in South Africa do align with those presented in literature (7, 8, 26) but this appears to have evolved through experience as opposed to a transfer of knowledge (from literature to industry). This evolution

through experience points to the fact that the industry's best practices are purpose fit to the application and validates literature in the South African context.

Of note is the application of modern technology by mSMEs to facilitate the risk management process. Examples of the technology used is instant messaging and video conferencing, both of which reduce the transaction cost by allowing real time communication without physical presence. Improved communication will build the relationship between the principal and agent (further reducing the transaction cost). In addition, it will increase the speed at which the risk management process can be completed.

Supplier selection plays a significant role in the risk management process as the mSMEs interviewed typically follow a single sourcing strategy. This strategy is a global trend for SMEs (8) and is confirmed in the South African context. How this affects risk management is that the management resources of the principal are not split among various agents, giving a high degree of focus (when required). Also, suppliers are often selected for work based off their existing relationships. As pointed out previously, these relationships have a high impact on the risk management process.

It is important to note that employees of an mSME must buy into the risk management process. An example of this is Company C who rely on their staff to monitor minimum stock levels against incoming orders and agent lead times. Henschel (2010) (31) identified this trend in SMEs operating overseas and it is confirmed in the South African context.

Theory-question 3 stated: What risk management strategies do mSMEs employ when engaging in local, outsourced manufacturing? This is a complex question that requires a knowledge of the process that mSMEs follow as well as which risk management strategies are applicable to the identified risks. The selected mSMEs in South Africa approach this in an informal manner but each owner-manager, fundamentally, applies the steps suggested in literature. Their risk management process has evolved through industry experience but does reflect aspects of best practice (with some areas open for improvement). This corroborates what Sunjka and Emwanu (2015) identified, and referred to, as a set of heuristic risk management rules that mSMEs adhere to (21). The same is true for the risk management strategies, none of the owner-managers interviewed expressed a high degree of formal training but the strategies that they apply are successful and, in fact, line up with suggested methods in literature. This evolution through experience suggests a lack of transfer from academia to industry with regards to risk management for outsourced manufacturing.

The critical research question (CRQ) asked: "How can a small and medium sized manufacturing enterprises effectively manage the various risks associated with local outsourced manufacturing within South Africa?" In order to answer this question, three broad theory questions where posed. In answering these theory questions, the answer to the CRQ emerges. It is proposed that mSMEs apply a complex and informal system

when managing local outsourced manufacturing risks. The root cause of outsourcing risks an mSME is exposed to can be traced back to the motive for outsourcing. The risk management strategies are diverse and need to be correctly selected and applied to the identified risks. The informal nature in which this process is applied enhances the subjective nature of the topic. It is interesting to note that the processes each owner manager has developed, evolved through their experiences but follows the framework suggested by literature. In combining the information presented in this discussion, an mSME has the tools available to them that will allow for effective risk management in the context of this research.

CHAPTER 6 REVISED CONCEPTUAL FRAMEWORK

In the literature review, an initial conceptual framework was postulated. When examining it, it appears almost linear in nature using a structure similar to a schematic block diagram used in systems engineering. However, following the interview process and subsequent analysis, a new conceptual framework is proposed. Figure 11 is a representation of this revised framework. The environment remains the same as what was given during the literature review as well as the general structure, that being the direction of the flow of goods from outside the environment to the agent, from the agent to the principal and, last, from the principal to the customer. What does change to the depiction of risk and risk management. The use of a Venn style diagram is intended to illustrate the fluid and overlapping nature of the practice in industry,

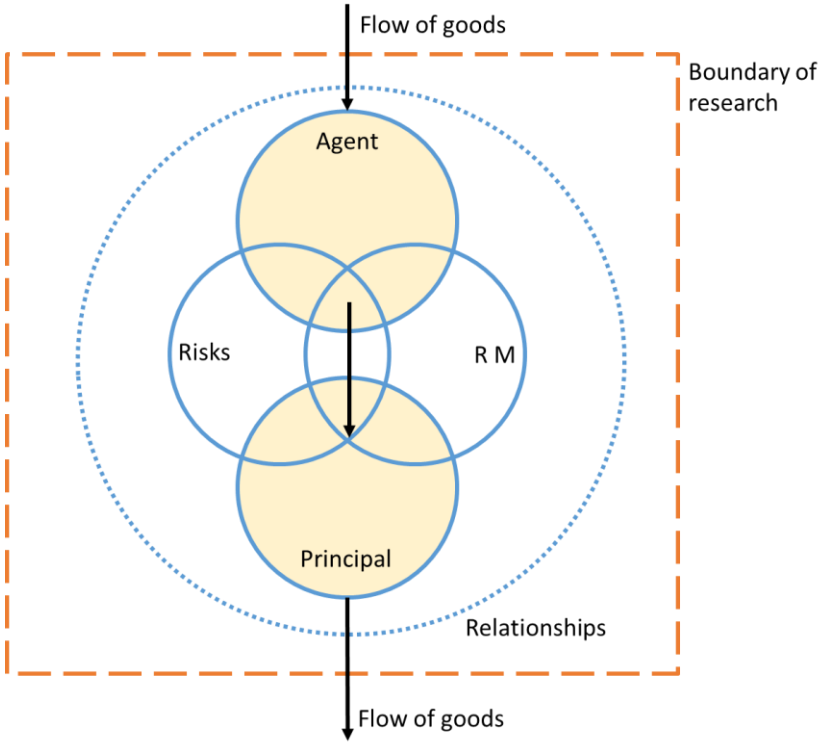


Figure 11: Revised conceptual framework (by author)

First, all the major items in the diagram are represented in the Venn Diagram fashion. The risks (on the left-hand side) intersect the agent, principal and the arrow indicating the flow of goods. What this implies is that the source of the risk can be either the principal (i.e. though supplying bad specifications) or the agent (i.e. poor in process quality). These risks then affect the flow of goods between the agent and principal. Risk Management (RM), is also depicted in a similar style. This illustrates that it is both the agent and the principal who can identify potential issues and apply corrective actions in the form of risk management strategies. The selected strategies depend on the type of risk that is identified. The management of these risks is both the responsibility of the agent and principal, but it is, ultimately, the principal who needs to ensure the risks he/she is exposed to are managed. mSME owner-managers practice all the forms of risk management strategies (barring a few highlighted exceptions) this is interesting as the impression from the interviews was that none had formal training in this area but built their skills over many years of experience. These skills have been

shaped by their personal history and experiences but has ultimately led to a similar understanding, between each mSME owner-manager, of how to manage the risks they are exposed to when outsourcing their manufacture. Each owner-manager's approach has emphasis on different aspects relative to their products and sector but all share a common thread.

The biggest departure from the original framework is the large dashed circle titled "relationships". It was evident that for the selected South African mSMEs the most powerful tool in outsourced manufacturing is the quality of the relationship between the principal and the agent. This relationship facilitates successful implementation of risk management strategies and identification of potential risks thus leading to on time deliveries of goods with an acceptable quality and cost factor. While not a traditional risk management strategy, it is proposed that it is the single most important aspect of outsourced manufacturing within the South Africa mSME space.

6.1 FRAMEWORK FOR OWNER-MANAGERS

This section highlights how the findings of this research are important to mSME owner-managers through describing an outsourcing framework that incorporates key aspects for risk management.

The benefits mSMEs gain through outsourced manufacturing are similar to those seen international literature. The benefits they seek are intimately linked to the motive for outsourcing. The decision to outsource is essentially an intentional or inadvertent make versus buy decision. The first question an owner manager should ask before outsourcing a product should link to risk avoidance where: can the firm do without the product? and, thus avoid all associated risks. If they must manufacture the product, the next decision should revolve around risk and performance trade-offs, which is still as form of risk avoidance. The owner-manager must ensure that the product fulfills the client requirements but minimizes the amount of functionality that is high risk to implement/manufacture. The decision must include a judgement about first implementing a "proof-of-concept" or prototype and, following successful field application, build subsequent evolution into the product.

Before issuing the product for manufacture, the owner-manager should select the supplier based on some criteria that must include a judgement on the quality of the relationship (or potential relationship) between the agent and principal as this is key in successful risk management. While legal protection is off limited value, it is still suggested to set up contracts such as non-disclosure agreements. In addition, the owner manager should consider horizontal and/or vertical chunkification prior to issuing information to an agent. Consideration should also be given to the inventory management system the principal wishes to employ as this may form part of their risk management strategy.

When issuing the product to the manufacturer, clear communication, which is facilitated by the relationship, must be emphasized. This includes communication around financial aspects (Cash-On-Delivery vs. Account basis), quality requirements and delivery schedule. In addition, there must be open lines of communication for the reporting of progress and potential risks, this can be in the form of progress reports, WhatsApp groups, skype conferences, regular site visits, etc. The communication facilitates risk identification and application of risk management strategies. The communication strategy must include information about the frequency of contact and preferred method.

Depending on the product complexity and volumes, the owner-manager must vary the emphasis on different aspects of risk management, balancing the technical versus financial aspects. In addition, as risks are identified, the principal must ensure that the correct risk management strategy is applied to solve the issue. At this point, the strategies could be: Monitoring and Coaching and/or Quality Control. Bearing in mind that there are not hard rules and there is overlap in the strategies but completely incorrect selection can prove disastrous as it may enhance the likelihood of occurrence of a particular risk.

The three most prevalent forms of risk for mSME's engaging in outsourced manufacturing are Financial, Quality and Delivery schedule. Which is most important is dependent on the complexity of the mSME's product and is a qualitative judgement for the owner manager. Loss of control of intellectual property is suggested to be managed through either vertical chunkification or through the quality of the relationship between the principal and agent.

An attempt to capture this is given below but it excludes the risk management decisions outside of the direct manufacturing process (such as prototyping)

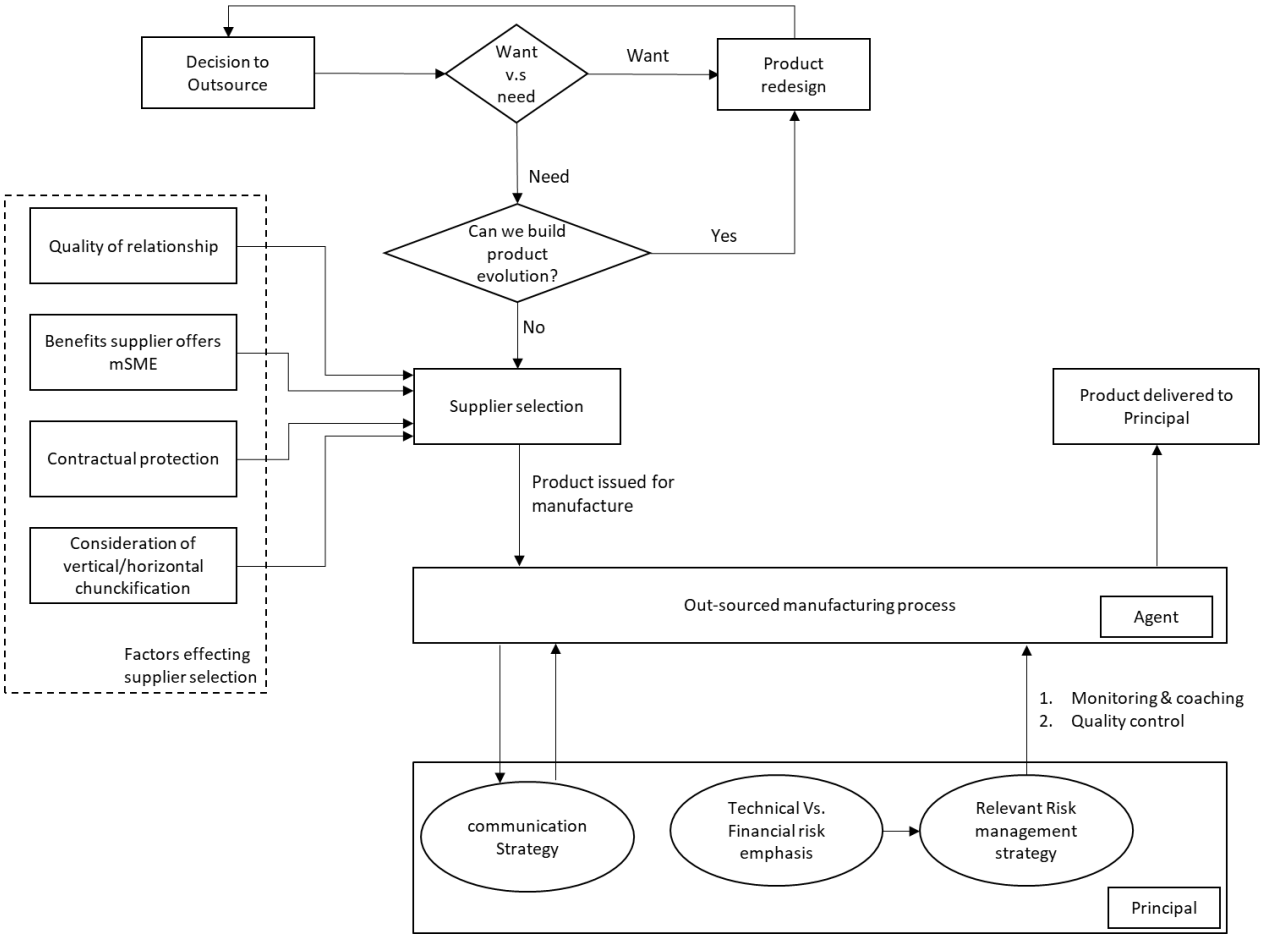


Figure 12: Risk management and outsourced manufacturing (by author)

CHAPTER 7 CONCLUSION AND RECOMMENDATION

The purpose of this research was to explore how mSMEs in South Africa manage the risks associated with local outsourced manufacturing. It has been illustrated that all the owner-managers interviewed practice a multi-pronged and sophisticated form of risk management that is informal in nature. This informal risk management approach has evolved through the experience of the owner-managers but, when mature, reflects the strategies identified in literature. There is minimal to no transfer of knowledge from academia/literature to practice. The complexity of the manufactured goods will inform the emphasis of technical versus financial risk management strategies. The biggest risks are, broadly, categorized into financial, quality or time related risks. Contractual means of protection are of limited use for an mSME's due to the associated costs of legal recourse, it is of more benefit to rely on a quality relationship between the principal and agent to manage ethical/legal problems. The relationship between the principal and agent is the most important success factor for South African mSMEs as it facilitates and improves every aspect of the risk management process from communication to dispute resolution.

This research will assist mSMEs that want to engage in local outsourced manufacturing by highlighting the benefits/motives, risks and risk management strategies that they could choose to employ. It will shorten the learning curve for new entrants and reduce the chance of business failure due to poor risk management. In addition, this research partially fills the gap in literature surrounding mSMEs and risk management in South Africa by examining and presenting the practices of industry against those presented in literature with the biggest point of departure being the importance of the relationship between the principal and agent.

7.1 RECOMMENDATIONS

A major recommendation drawn from this research, in reference to future South African policies, is centered around the perceived lack of legal protection offered to mSMEs in South Africa. What this leads to is the thought that South African should establish a structure within its legal system that is designed to serve mSMEs (and SMEs in general). The goal of the structure would be to reduce the costs an mSME would carry should they pursue legal recourse. The lack of effective legal protection for mSMEs in South Africa is a major deficient in the risk management strategies it may choose to use when outsourcing its manufacturing.

Recommendations for future research into this topic are

1. An investigation into risk management that focuses on the interaction between the principal and customer.
    a. Alternatively, examining risk management from the perspective of the agent would be of value.

2. What are the optimum communication strategies a principal should employ to enhance the likelihood of successful risk management?
3. What causes the lack of knowledge transfer from literature to industry and how could it be improved?
4. What are the primary factors an mSME in South Africa should consider when examining the “make versus buy” decision for its products?
5. Given an mSMEs manufactured product characteristics, what is the optimal stock holding strategy to minimize risk?

Some limitations to the study that were identified during the analysis and discussion are presented here. First, there is a low number of participants. It was difficult to source the four (4) firms that did participate. Various engineering groups where engaged in the search but most were identified through direct industry contacts. Perhaps this points to the poor state of manufacturing in South Africa but also to the fact that there are no industry bodies that cater specifically for mSMEs.

Second, if the interviews probed further into the personal background of each owner manager, rich information could have been extracted with regards to the subjective approach to risk and risk management exhibited by each individual. Last, some of the interview questions were not couched at the appropriate level as there was an assumed level of education of each owner manager. This assumption proved to be incorrect in one (1) of the interviews.

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CHAPTER 9 APPENDICES

9.1 APPENDIX A: RESEARCHER BIAS

As discussed in the Research Methods section, the lead researcher's current knowledge on the topic is recorded in this Appendix and, by doing so, researcher bias can be avoided.

Risks that mSME's are exposed too when engaging in outsourced manufacturing:

- Poor training of South Africa Artisan labour force.
- Subcontractors lack of understanding of standards, leading to low quality work.
- Lack of supplier qualification procedures, leading to selection of poor-quality suppliers.
- Timeline creep by manufacturing agents not effectively managing their subcontractors.
- Part suppliers not performing sufficient internal testing leading to incorrect supply of stock items and project delays.
- No factory acceptance tests being performed on stock items leading to project delays.
- Poor quality control on subassemblies, leading to re-work requirements and project delays.
    - Poor interface management.
- High labour costs.
    - Militant labour force
- Load-shedding leading to project/production delays.

- Poor quality work leading to warranty claims.
- Theft of IP and competitor designs ending up close to originators work
- Opportunistic renegotiation by subcontractors.

Risk management at mSME's

- Adhoc basis, dependant on experience of owner.
- No formal method.
- No planning and problems dealt with as and when they arise.

9.2 APPENDIX B: INTERVIEW SCHEDULE

1. Introductions, what this research is about and why am I would like to interview you, how long I expect the interview to take and what is the topic for the interview,
2. Brief discussion on the participant information sheets and consent forms,
3. The participant will be asked:
    a. What is their name and position at the company?
    b. What does the company do?
    c. What is their background in this industry?
    d. What do they get manufactured?
    e. How much of their manufacturing do they locally outsource?
4. The interview proper will start here,
    a. **Theory-question 1:** What are the perceived benefits of local, outsourced manufacturing?
        i. **IQ1:** Why do you outsource your manufacturing?
            1. **Probe 1a:** Do you consider manufacturing as a non-core activity for your company? Why?
        ii. **IQ2:** What benefits do you think your company gets through outsourcing your manufacturing?
            1. **Probe 2a:** Which of these benefits do you think is the most important for an mSME?
    b. **Theory-question 2:** What are the risks that local mSME's are exposed to when the outsource some, or all, of their manufacturing?
        i. **IQ3:** How would you define what risk is?
            1. **Probe 3a:** Briefly discuss probability and consequence as characteristics of risk with the interviewee.
        ii. **IQ4:** What are some of the problems you deal with when you outsource your manufacturing?
            1. **Probe 4a:** Do you experience any problems with delivery schedule, budget and cash flow, quality and loss of control of IP?
        iii. **IQ5:** Which of these do you think are the most important to keep your eye on (how would you rank them)?
            1. **Probe 5a:** Do these rankings change on a project/ product/ monthly basis?
    c. **Theory-question 3:** What risk management strategies do mSME's employ when engaging in local, outsourced manufacturing?
        i. **IQ6:** How do you deal with these problems (identified previously)?
            1. **Probe 6a:** Do you have any formalised method for managing these risks? (i.e. DoD's 4 step management process)

2. **Probe 6b:** To what extent do you think your personal background or experiences shape how your company deals with these risks?

ii. **IQ7:** If the ranking of the problem changes, how would your approach in dealing with them change?

1. **Probe 7a:** Perhaps split them into probability of occurrence and severity of consequence.

iii. **IQ8:** Would a framework combining industries best practices and literature be of any help to you?

5. In closing, the main points will be summarised, and the participant will be informed that the next steps in the process are to collect further data from more interviews. Following that, all the information from the interviews and literature will be analysed and a guiding risk management framework developed, and
6. The participant will be asked if they would like a copy of the final research paper and framework at the end of the project.

9.3 APPENDIX C: PARTICIPANT INFORMATION SHEET

By: Michael Walters
Student number: 381989
Date: July 2019

Dear Participant,

Re: Participation in Research on risk management strategies for SME's that outsource their manufacturing

Thank you for offering, via your response to my email, to participate in an interview.

I am a part-time MSc student in the School of Mechanical, Industrial and Aeronautical Engineering at the University of the Witwatersrand, under the supervision of Mrs Bernadette Sunjka. My MSc title is: Development of a framework for the management of risk for SME's in South Africa that outsource some, or all, of their manufacturing requirements. The research is partially sponsored by the Manufacturing, Engineering and Related Services SETA (merSETA).My belief is that SME's are not provided with enough support around risk management for outsourced manufacturing or tools to identify and manage these risks. I would specifically like to understand how you approach the risks around outsourced manufacturing.

I would like to formally invite you to participate in this study. As an industry participant of the well-established SME manufacturing company in South Africa, your knowledge and experience would contribute significantly. The study will be conducted between July and November 2019. Involvement in the study would entail one (1) or two (2) face-to-face interviews with you, as the senior person, at your convenience. During these interviews I would like to understand what the types of risks you see (or are exposed too) with outsourcing manufacturing and how you/your company manage them. The interviews would be conducted at a place convenient to you. A short walk-through tour of your facility would be interesting, if you have the time and are willing to do so.

Participation in the study is voluntary, and you may withdraw at any time. Anonymity (regarding company name and any owner/manager/employee names) and confidentiality of information provided will be assured and respected. I would like to record the interviews, so I can later transcribe them. Your consent at the time of the interview will be requested. If you do not wish the interviews to be recorded this will be respected. The results of the study will form part of my MSc dissertation report and may also be reported in academic papers and at conferences. A summary of the results of the research will be made available to you on request.

Please contact me if you have any questions regarding the research and participation in the study.

I look forward to hearing from you.

Yours faithfully
Michael Walters

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9.4 APPENDIX D: PARTICIPANT CONSENT FORM

By: Michael Walters
Student number: 381989
Date: July 2019

Dear Participant,

Thank you for accepting to participate in this study. Please complete this consent form as you see appropriate. By signing this consent form, you are indicating that you have read and understood the description of this study and that you agree to the terms as described below:

	Mark with X	
	YES	NO
I confirm that I have read and understood the information about this study as provided in the participant's information sheet.		
I understand that my participation is voluntary and that I am free to withdraw at any time without any penalties or negative consequences against me.		
I grant permission for the interview to be audio recorded.		
I agree that the information I provide may be treated as strictly confidential and anonymous and only the research team will have access to the interview data.		
I understand that the information acquired from the interview will not be recorded in excess of what is required for this study.		
I agree that the results of this study may be recorded in academic journals and at conferences.		
I have had the opportunity to ask any questions related to this study and I have had all my questions answered to my satisfaction.		
I may request a report summary, which will come as a result of this study.		

With full knowledge of all above-mentioned terms, I agree to participate in this study.

Participant		Consent taken by (Researcher)	
Name		Name	
Signature		Signature	
Date		Date	

9.5 APPENDIX E: SIC CODES FOR MANUFACTURING

Below are all the Standard Industrial Codes for the manufacturing sector (26).

Manufacturing Sectors:

311, Food Manufacturing
312, Beverage and Tobacco Product Manufacturing
313, Textile Mills
314, Textile Product Mills
315, Apparel Manufacturing
316, Leather and Allied Product Manufacturing
321, Wood Product Manufacturing
322, Paper Manufacturing
323, Printing and Related Support Activities
324, Petroleum and Coal Products Manufacturing
325, Chemical Manufacturing
326, Plastics and Rubber Products Manufacturing
327, Non-metallic Mineral Product Manufacturing
331, Primary Metal Manufacturing
332, Fabricated Metal Product Manufacturing
333, Machinery Manufacturing
334, Computer and Electronic Product Manufacturing
335, Electrical Equipment, Appliance, and Component Manufacturing
336, Transportation Equipment Manufacturing
337, Furniture and Related Product Manufacturing
339, Miscellaneous Manufacturing

9.6 APPENDIX F: INTERVIEW TRANSCRIPTS

Interview with Company A on 30 August 2019

Michael. can you tell me a bit about what are mining does, what you manufacture how much of that is outsourced locally?

Company A. It started out in consulting. it's very involved in consulting but is moving towards related technologies in mining but primarily the explosives space, so um the sort of work we are involved in would span from both mechanical technologies, fabrication, mechanical components, through into electronics and control systems integration now with databases and through, finally, to complete software solutions that come completely together and create a process flow through the mining cycle and passes Bosses information from step to step as you move through the chain.

Michael. so, the 1st question would be why you outsource your manufacturing as opposed to in housing it?

Company A. probably 2 considerations there the 1st would be the amount of capital required to set up manufacturing operations and achieving a certain critical level where you actually run it profitably by yourself with permanent guys on staff and acceptable quality and management and stuff to look after it internally. you kind of trust that by using external guys who are established and have a slightly higher workload and having both the right relationships you can then build it at a lower cost than trying to do it yourself but then the second side of it would be trying to cherry pick the areas of highest profitability so fabrication right now in South Africa … anyone can build you stuff at cost because they're just looking to keep their doors open so there's really no reason for you to get involved cause you can't do it any cheaper yourself so as long as you have the right team building it you really don't want to get involved as it will eat up your management resources

Michael. do you consider manufacturing as a non-core activity for your business?

Company A. good question, the performance of the product is core. So, provided they deliver against the spec so What's more important is the spec and quality control. and provided that's taken care of the actual manufacturing is less so, the list stop provided the actual manufacturing of the product is less core. the delivery of the value proposition is core. manufacturing is not.

Michael. Those benefits that you had mentioned previously is there a particular one that you think is most relevant to an SME

Company A. most important to us would be the level of experience and skill in those undertaking the work it would either take time to build internally or cost money to bring them on board if they already had the knowledge so the capital conundrum is in play where you don't really have that amount of capital as an SME and you can't really get that going unless you are established and your production could justify the setting up of your own facilities you only really want to bring that in house if you see an opportunity to generate significant capital as opposed to investing that money somewhere else. I am an advocate of relationships these days I guess maybe I wasn't in the past but it is becoming more and more apparent that those relationships are how things get done the better your relationship is with your manufacturers better service and better outputs you'll get in someone who doesn't

Michael. interesting that you would say that because that aligns with a lot of what I've read in papers where they show manufacturers do rely a lot on building strong relationships with their suppliers but all of the papers resolves around offshore manufacturing where you manage outsourced to China where you get access to massive economies of scales and lots of expertise the local paper on is it means that manufacture say that building of relationships is key. so, onto the risk side how would you define risk

Company A. Obviously, risk has a huge number of factors to it. ultimately it is the failure to deliver what you promised to the customer and the failure to deliver that value proposition, as long as you can meet. the greater the risk that you fail to meet the value proposition the greater the risk is. it may be time based maybe quality based it may be financial damn for me the biggest one is time, the more you can get out in the least amount of time possible the less your overhead is, your overhead is often a significant contribution to the overhead for the manufacturing company big businesses often took big prices for things but so much of that is built into the actual cost of Labor for developing and managing manufacturing postings so if you are able to build up those relationships and have part of that work and you have guys who will do you believe will deliver against the spec you put in place in the time that you requested that is then very important cause then you can use your limited resources to bring in additional revenues, so as long as you know that you're going to get the quality you require in the time that you require. there always going to be hiccups in manufacturing I don't mind I hiccup as long as it doesn't impact the value proposition to the customer so if it happens the question is how do we fix it then the cost implications as long as we've handed over a clear manufacturing spec if that is at our fault, it’s our risk. Yes thank you in financially will have to cover something like that but likewise using expect that whoever is doing the manufacturing that if they haven't made the spec they would obviously come to the party on that and if it lies in that Gray area which it often does that's where the relationship is very important because between you and the supply you need to work it out and you need to work it out quickly and not get caught up in big corporate arguments about it because there's no time because ultimately that value proposition is worth more than any profit you'll make on the Top because you'll make it up in future jobs so at the end of the day getting that product out to meet that value proposition is critical

Michael. so I guess I just wanted to direct it a bit so I just wanted to mention is a cool systems engineering document by the Department of Defense in America where they define risk as having probability and severity of consequences for you heard of this I just wanted you to keep this in mind for later. It's important because later when we get into how you manage the risk I wanted to maybe look at if a particular risk probability of occurrence changes would you manage it differently or if the consequence of that risk changed how would you change how you manage it

Company A. so the probability and severity are very much exactly what I was talking about you learn
Michael. So I guess just to put it out there maybe you could list some of those problems you deal with when you do manufacturing you had already said that one of the most important ones to you is quality and time yeah you line
Company A. I would say those are the 2 biggest meeting the spec and then the time commitments then outside of that the cost you know up front so outsourcing it provided you have a number up front you know what your applications are up front new space news of base what about loss of control of IP how do you consider that

Company A. so that again would turn to the relationship so yes we do not send out stuff to certain manufacturers because of that so that is a valid consideration and that is Siri or not app requirements in order to do entry into this fear to participate to work for an RFQ and that is one of the main considerations if you don't trust someone and you don't think your IP is safe with him well then they don't make the list irrespective of the price because price really accounts for someone who you believe will have your best interests at heart

Michael. mentioning vertical chunkification an horizontal chunkification as a method of IP protection

Company A. on that we actually do that with the Chinese where we only give certain parts of certain projects to different suppliers so that nobody has the whole project

Company A. this still certain guys we wouldn't give work to irrespective of that

Michael so we've really covered the points that it's most important to keep your eyes on which are the quality speak the time slash delivery schedule, so do you be view these as being in flux, do they change monthly on a project product or monthly basis or do you consider them constant

Company A. there is an ideal and in the ideal world the quality is more important but we're not particularly good at planning as S Africans and when it is applied to the mining industry you're finding your mines always give you about half the length of time that they should complete the project so it often would then have an impact on how you deliver on how you deliver basic quality you can in the best time. You can but often that longest time. You can be less than half of what you would like so it will have an impact on the other activities

so then you just up the pressure on the suppliers and you dictate what the time. Is and you tell them that you can't go outside of the time. That's how we make sure we deliver to acceptable standards within the given time.

Michael and you can apply that pressure because you've built a good relationship with the supplier

Company A. Yes, without that relationship you can't apply that amount of pressure

Michael so I guess when you deal with these projects and the quality is and the quality is poor, and the project is behind schedule your first port of call would be your relationship but how else would you try to tackle this

Company A. so as an SME last port of call would be legal that just doesn't help you in meeting that value proposition that we had discussed, so outside of the relationship is not a hell of a lot you can do to save a project and throwing legal documentation backward and forward doesn't help anyone because there's always an argument from both sides as too why something may have been out of speak so you need to pick it up early so you can manage it come at the management side of it is very important if you are on time but things are out of spec you need to pick it up early so that you can put a plan in place to recover from it the sooner the client knows the situation debated and if that is the case because if you do indeed miss a deadline you don't want them to find out the day before that you are going to miss you want them to know well in advance so that the project can be shuffled around outside of that if it was a big blunder on a small piece of equipment and they were guys that could get it right then we would go as far as bringing in another contract to do the rework but the financial implications on that are less important and but if it was a major component then obviously that's a space you really don’t want to land up in yeah

Michael so I'm do you have a formalized process that you use to manage these risks is there a formula is processed within I mining that you or your team members could apply

Company A to manage risk. No

Michael so I guess the follow up question to that which I feel like the answer might be obvious but to get it on the record is to what extent do you think that your personal background and working experience has shaped are you view these risks and how you deal with these risks

Company A. massively I'm sure, if I came out of very corporate environment which had a very slow response time and that maybe we were talking about larger contracts with formal structure involved in how those contracts are prepared, that's not our game that's not our space we can't afford to cover huge overheads for long periods of time in order to win a contract like that so I'll game is really speed and turn around because

that's very attractive value proposition in the African market where guys are often behind where they should be so under those sorts of circumstances an operating in that space are 2 biggest things are yes there is a spec that needs to be met but the ability to get that speak out quickly and have a fast turnaround time and have the relationship in place (with suppliers)that will push you to the Top of the list so that often our work is done by often prioritizing it otherwise we would sit in the same queue as everyone else and have a 3 month lead time Hey caught where is if you can get your job to the front of the queue it can be out in a few weeks
Michael based on their relationships right.

Company A. and that makes a world of difference because it allows for rapid turnaround time which then reduces up overhead time on a project which then means that at the end of the day even though the individual aspect of the project may cost a little more the ability to get these projects out with less overheads means you are still sitting in a good position from a profitability perspective. So, the segment in which you choose to operate will definitely influence how you choose to prioritize those factors.

Michael. Interesting. I had wanted to talk about these risks and if they change. So, for instance the likelihood of poor-quality increase to a critical level. How would you deal with that? Fleet wide defect with low severity of consequence.

Company A. Is it within an acceptable spec or not? If not, it has to be rectified. If it is not perfect but within an acceptable spec, then less so (viz. may not need replacement). If it is within a functional spec, so a blemish here or there … so be it. It is something you would still want to rectify but not something that would require you to redo work you put out previously. Um would it impact on how you choose suppliers going forward? Definitely. I do believe in getting involved in you suppliers' operations. So, it's not just a case of "well here is the spec, deliver it". We aren't 100% sure on how our projects will unfold so, therefore, we will work with you in your business to make sure that if challenges arise, we work with you to make sure we put the correct solutions in place. And so, with that approach, if we found that certain blemishes or something were coming out in a project, we would still try put something in place to improve the quality control through the manufacturing process with the supplier to make sure the right stuff comes out and you can only do that if you make sure you have the right relationship and you can actually get yourself into your suppliers business.

Michael. I find it very interesting. Relationship thing. Is reflected in other papers. Do you think it would be of benefit to the SME industry in SA if there was a framework for managing outsourced manufacturing risks?

Company A. It would be very difficult to ask. It's not only that you are an SME but is also a factor of the sector you are choosing to service. And that will play a massive role in it. So you could be a small SME but if you work with very large contracts and you are very structured in your approach to them will be very different to what we are focusing on which is more of a time based, all about speed and getting things out.

Too meet the needs of the customer and not to play the big structured corporate thing behind it because what we can get out in a month you (the big corporate) would get out in three. So that has very big implications on how you approach that framework but maybe that can also be built into it. There is definitely a need for the knowledge and an awareness of the risks involved and how to avoid them but to build the framework … you could build a guideline.

Michael. Yes, a guideline. You can watch these things; this is what might happen?

Company A, well, a lot of it I see as experience. The question is, if you are new to this space and you don't have that experience, you haven't had your fingers burnt a couple of times and (Michael. You need to ramp (viz. your knowledge) up quickly). So, there the theoretical understanding of the risks, dependent on the sectors you are focusing on and your value proposition is. It could be beneficial in bringing people up to speed on what the risks are for what they are trying to achieve. (Michael. I think um … just because I work in the same sector, there are not a lot of guys who outsource. It will be interesting to see if the interviews from people in different sectors yield different results).

Company A then called after the interview to relay a story about a project where the supplier was very behind schedule and they had to can the project with them and start from scratch. That was also at a point where they were trying to build a relationship with a supplier and, in this case, it failed.

Interview with Company B on 31 August 2019

Company B. So Company B. We are an electronics company and we focus heavily on creating automated measurement control systems and solutions. That involves a mixture of products we acquire from overseas to products that we make locally. The African environment is a unique environment, so you really need to look at what is the need and how do you ramp up because the equipment form Europe is pretty advanced. So, if clients have not advanced through the years (viz. with the equipment) you need to pick them up in step formation to that level. The European equipment is there, it's been researched and is available, so I have really done scans for best of breed. What's available, electronic companies that have the best measurement systems. This is all in the rail space, we don't really look too much out. I could talk a bit about the market outside of rail but in rail I have really looked and scoped through the years and have acquired solid electronic development and manufacturing companies overseas that really focus and specialise in those areas. So, don't have to focus there because I know that they have that area covered. For development and manufacturing in that technology.

Michael. And locally?

Company B. So locally the challenge would be to acquire those types of technologies into the country and then the only we try get involved in is manufacturing what you can do locally. So obviously, quantity is important. So, with measurement systems, it's not bulk. So, it doesn't help to set up a plant.

Michael. So, it's speciality?

Company B. It's speciality electronics and cards and if there are small numbers it does not make economic sense to get them manufactured. But the bulk steel components, brackets and those kinds of components, it's easy. We sometimes share the design or improve on the design. So, we get involved with taking that overseas technology into the field (viz. in SA). But then there are technologies where European, American or western technologies are just not good enough. Yet. Because you have the problem where an African railway company can't even get their locomotives to start and now you want to come and put in these fancy measurements and control systems but there is no locomotive that will start-up. If you could maybe jut fire up and get their locomotive to start, they would be happy. Secondly it is to get it moving. That would be the next step.

Michael. So maybe. Thanks for that. To start the interview proper, maybe you could tell me why you choose to outsource your manufacturing as opposed to doing it internally?

Company B. Before I get there, I would just like to add that we do our own products when we see there is a gap so there are a couple of products, we do ourselves.

Michael. SO, you do some manufacturing yourselves?

Company B. So, when it is our own design and own idea and we manufacture in house.
Michael. Being an electronics company, when I say manufacturing lets include in that: software development. So manufacturing is both manufacturing of software (or development work) plus the actual hardware component. So, it can be either or for the sake of this discussions.

Company B. Actually, the support for the entire lifecycle of the product as well. So, even for our own products. When it comes to the clients we deal with in the market, to comes to a price crunch. Because there is a certain budget they are working on. Bigger budgets you can plan for in the future but immediate and medium-term budgets, up to two years, are very difficult to obtain. So, the only way that we see it fit is that we have to systematically approach basic technology that you can ramp up and then price becomes crucial for these clients. So therefore, we start using manufacturing between china, because in electronics, the best pcb electronic board manufacturers sit in china. From electronic components, the silicon semi-conductors, all those components don't come from here. So, we do that for a prototype. So, for a prototype we will manufacture.

Michael. SO, your choice for outsourcing your manufacturing is based on the specialist knowledge of your manufacturers? So, they have specific knowledge on the components you need manufactured and they are the best at it so that is why you choose them?

Company B. Yes, they are the best at it, and they have got strong relations. It becomes their core business. That they manufacture many pcb's for many clients. Whereas we are focussed at a small sector compared to a pcb manufacturer who does it for the world. So, our core business is to not manufacture PCB's. Our core business is too actually design and create the pcb and then to have this manufacture facility produce it. So, if number and price can compete with the market in which we operate in then we will gladly build up the local facilities. We always compare local manufacturers, parsec and some others (with pick and place machines). We have small pick and place machines for prototype and pilot work. But for the roll out we can use south African companies, but SA companies are always much more expensive than our china partners. So that why we always tend to go to china unless government forces you too, then the price is significantly a lot more.

Michael. So, more specifically, do you consider the manufacturing as a non-core activity for your company?

Company B. It is core for the hardware. You have created the product and developed the blueprint so now you want to be able to sell the product with any software licenses that go with it. SO, the core for me is an extension of the business and it does not need to be inside the business. It can be outside. So, I do look at local partners and if they are too expensive and cannot handle the lead times then I go out overseas. For me to include a manufacturing division in my own business, the quantity and the … Michael, the capital requirement? … Yes, there is a capital requirement to start it up, but it must be sustainable. If you start it up just for a one-year project, it is not worth it from a sustainability point of view because our focus is on creating the blueprints.

Michael. And the benefits you get from outsourcing your manufacturing? You said A) it's the access too external capabilities, they also manufacture high volume stuff which you could not really do internally, yet.

Company B, so by outsourcing it we can get the best partner that focusses on that manufacturing portion and you get all the benefits. You get the best machines, the best workmanship, the best quality, the best workmanship through the manufacturing process and you can really set a very successful batch of manufacturing to take place.

Michael. Do anyone of those benefits really stick out for an SME? Which, as an SME, do you think is most important or do your think they are all equally weighted.

Company B. So, as an SME, we focus on creating the idea and putting it into practice. The IP. Prototypes and testing the concepts in an industrial environment. So, if somebody else is handling the manufacturing, we don't have to take out the initial capital and we don't need to take out the resources to be able to manage and ensure that the manufacturing portion is up to our standards.

Michael. The next questions now revolve around risk. How would you define risk?

Company B. So, it depends what risk. There is a financial risk and then there is an engineering/technical risk. Shall we talk about the technical risk?

Michael. Well, in general terms. Maybe you can describe how you define risk in finical terms and for technical terms?

Company B. So, for me I always look at the sustainability of something. I don't like to get involved with something that is once off as it takes a huge amount of our energy out of more sustainable opportunities, so I really look at what is the risk in terms of sustainability and growth. So, in terms of technical, you can't have a failure with your products in the field. That is a very high risk that you need to control. You need to ensure that you do not have failures in the field. Because failures in the field means a loss of your margins as well as the potential loss of your margins on other projects to rectify the issue, especially if it is a bigger scale project. So, we really look at from the design/creating stage, is to understand the environment first, to move into the environment, to spec the environment, to liaise with the client and to draft up the total system of the environment which the product is going into. Then you will address all these risk factors or factors that the product will be … you will insert the product into an environment and then the product will be susceptible to these environmental factors. So, we look from a theoretical stage first and look at all these factors so that we build a product according to that and we test the product through its prototype and pilot stages to make sure that we mitigate those. When we manufacture the product, we really draw up what quality checks need to take place on the product, but it all needs to be based on that original product spec that we drew up. And that is crucial to us.

Michael. So, you, what I am hearing is that one of the main risks is the quality of your product as that effects it's performance in the environment?

Company B. Yes. And it's quality in terms on the design but also in terms of the manufacturing. You can have one of the best designs and manufacture it poorly or you can have a bad design and manufacture it perfectly. So, they both go hand in hand as part of the risk factors.

Michael. So, would you be able to define risk? I read the DoD systems engineering fundamentals and they define risk have having two main characteristics. Probability of occurrence and severity of consequence. So, bring that to the example you gave that would be like having a "small" quality control problem, but it manifests in every deployed item vs a major failure that only happens once every 100 items. So that's something to just keep in mind as we go into the interview. Because later when we look at how these risks are managed, I would like us to consider how that would change inf the risk occurs more often vs less frequently or how would you manage it if it was a catastrophic failure on a single unit.

Company B. So that's a trade-off study that you perform in the environment. You put down what does this environment hazard or situation poses to the product. You must understand, I know that military spec but the smallest thing in a military aircraft can bring that aircraft down if it was overlooked. So, it's really a trade-off study. Where you really need to build a value system into it and you need to put in weights, you got to put in logic to these environmental risks and impact. So, it is two characteristics, but occurrence is one aspect but sometimes that might not be important. Big or small could be important but you have to really study that up front (Michael. And make a qualitative judgement?) yes. What you have not defined you don't know. And that's dangerous.

Michael. So, if you could list, what are some of the problem's you guys have experienced when you have outsourced you manufacturing? What are some of the typical problems that your suppliers end up giving you?

Company B. So, can I talk, I can say, for the product, when we design the product, we didn't encounter some risks in terms of simple things like cable and connectors.

Michael. So that's quality based?

Company B. No, that's a design-based issue. We designed it that way and the manufacturing took place perfectly but when it was integrated into the environment, cables started to push out and that means the failure of the entire systems because of our module. Other things that we do is that when we go out to manufacturing, when your documentation pack is not complete or you don't have initial serious interaction with the manufacturing partner to understand or you don't keep on top of it, you don't have regular, structured processes where you come in and visit at certain stages of the manufacturing process. So even though they are taking on the manufacturing you need to be there. For some of our products, willie, our technologist, was there permanently. From morning to night because the initial paperwork was, the inputs initially wasn't adequate enough and the timelines were just too short. So, things went into production immediately. So that's how we manage, we manage the risk in such pressurised circumstances. We manage the risk by putting your resources into the manufacturing loop. So, it's not just a document or discussion, actually put your own company resources into you manufacturing partners resource system.

Michael. Do you every experience problem with the delivery schedule form the manufacturer?

Company B. You can if you are not part of the loop but the way we manage that is we have a process and we build ourselves into the manufacturing partners process.

Michael. So maybe to put a word to it, would that be considered “building of relationships”. So, you have a good relationship with the manufacturer or is that less of factor in your industry?

Company B. I wouldn’t say this process is part of the relationship, but the relationship is established before and as you work together that strengthens the relationship and the abilities you do have and how you work together. So, they allow us to work in their factory. In china. So, there is some localisation, we send South Africans to go work in the china factory, together with the processes.

Michael. And as an SME to you guys every have problems with suppliers and your budget/cash flow.
Company B. So, I don’t partner with everyone. I am very selective. Just like friendships that you have, it’s very similar in business, you need to develop and build that friendship. And you build that trust and faith, it’s very important. So, when you really connect with someone in business, it’s similar to a friendship and you build that trust and faith so when you do business together it’s like second nature to work together and be one team.

Michael. The next thing I had wanted to ask is how do you, do you every have problems with losing control of your IP that you have now issued to a manufacturer? Based, on what you just said you seem to be reliant on the relationship and trust that you have built and that would help you manage the loss of control of your IP?

Company B … I do perform the legal paperwork, but I can say from experience that if you don’t have the relationship, with trust and faith, the paperwork won’t help you. If somebody wants to go against you then you must see that in the relationship you are building up. The paperwork is something that you could use but from my experience in legal work it is extremely difficult to tie up the legal paperwork to ensure you have full protection. Therefore, it is more important that you build a relation and to have the relation both ways, not just one sided. So yes, when I start off you build up the relation, but you also put the paperwork down. I put NDA’s down, I am starting to put more and more contracts upfront, but you must understand that people are different. If you put a contract upfront on a relationship, then there is no relationship to build. We are human beings. Human beings have a culture and you need to nature that culture so you can build relationships based on friendship and trust. You can’t build faith and trust in a document. A document will basically highlight what was already discussed and believed in. I use that to mitigate those risks. A solid relationship

and what I speak is what I preach. I don't change my word. The is a saying "you must be a man of your word" because then, as a man of your word, you can put that into a document or else that document is complicated. Michael. As an SME, do anyone of these particular risks we have spoken about standout as the one that you need to keep your eye on the most.

Company B. Based on an SME? What is the most important to pay attention too?

Michael. For you guys, when you outsource your manufacturing, what are the key risk that you pay particular attention too?

Company B. The biggest risk would be communication. Not having the right communication. So, giving poor designs and not being able to, through an open channel, discuss on a regular basis, the interfaces. Sometimes there are changes, so the communication is the biggest component of risk that you have to manage. Especially when you have changes. So, you have to manage this efficiently. Because when you do things rapidly, these are all things that happen in parallel. You have a design; it goes into manufacture and there are changes that happen. Especially with interfaces. It might not be the hardware but there might be interface changes that might affect. So, you have this constant loop that you have to manage. Form when you create something and as you go down towards the manufacturing and producing all of your devices for market. Any changes you need to deal with, at any stage, requires close communication. Sometimes the production line has not yet started with something, so the changes are possible. Other times things go smooth and there are no changes but that is a very rare situation. In life. And it's based on everything. Clients give late changes and then you cannot say no to the client, you have to accommodate them. Sometimes you cannot accommodate the client, you can only accommodate the client on a second version. But really, as an SME, we are at the client's mercy. So, we really, look at pushing and seeing what we can fit in. That's why the upfront environmental study, and client study, too write the specification about the environment and client is crucial. That sets the basis.

Michael. Maybe it seems obvious after what we have just spoken about but do these risks, in your eyes, change on a per project, weekly or monthly basis?

Company B. Each product has its own portion of unique risks associated to it because it is a different product and it is, perhaps, going into a different environment or a different client. But most of the risks are pretty much similar. Because we are building electronics. And software is the same, version control is a big risk. That the versions are not tightly controlled or there a quick change because of emergencies. So, when you get into fear, panic mode, that is a risk you have to get out of because you are not allowed to go into panic mode. And software guys … they are different breed.

Michael. Are there specific ways you guys manage the different risks? Like communication vs poor quality. Are there different ways you approach this, or do you follow a similar recipe when there is a risk?

Company B. In general, you follow a similar recipe. You open up whatsapp groups, skype conferences, to actually putting a team together. And looking at feedback/progress report. So, I don't look at hour, I am not an hour booker, but I do look at what has been achieved per day, per week. Then I have feedback with the authorities in my manufacturing partners.

Michael. So, it's a semi formalised management structure?

Company B. Semi formalised?

Michael. So, the way you deal with these problems in manufacturing. You always start with progress reports, whatsapp groups, skype conferences and then if that does not resolve the issue then you would move too sending personnel on site and the, eventually, to sending a team full time?

Company B. No, it's how the project progresses. It will always be available to open, multiple communication channels. So, to send a person on site is part of the process depending on what product is being developed and what the pressure is. So, if there is limited lead time, you pull all stops. Because you cannot fail and if there is time, you don't need to pull out all stops, you can use different communication channels and you talk regularly, and you have reports. I am not a person who likes to go into formal company processes because the moment you do that, you take away engineering time, you take away development time, you take away problem solving time. So, I don't like formal processes. I am an informal person, but I need everything to be documented. When progress steps are achieved, so that there is a history we can look at, that you can track going forwards and going backwards.

Michael. How do you think that your personal background and experiences has shaped how you approach these situations?

Company B. I use a company's formal process and structure as an example or suggestion and, look, in china, there are formal structures you have to follow in terms of procurement and basic manufacturing process but that is why it is important that I discuss, upfront, my requirements. We tailor fit the process, so if the customer is demanding a meeting but there is no fruit coming from that meeting then I would rather say, just leave it and spend the time focusing on something more important.
Michael. And that's from your personal experiences that you have figured out that that is the best way of doing it?

Company B. You can take someone's process and fit it to both. Because that's your process and I am coming from a different environment, company or industry so I want to be able to tailor fit that.

Michael. And that is for both local companies as well as offshore?

Company B. Yes.

Michael. If the rankings of the risks change during the project, how do you prioritise what to address first?

Company B. You are talking about in manufacturing?

Michael. In manufacturing.

Company B. So, in roll out phases, we staunchly use project management mechanisms there. In manufacturing processes, you have your design pack and the manufacturing process takes that from stage to stage. So, you have to define the critical path elements, what are the bottle necks? What things can be done? What has to be done in series vs. parallel. And sometimes you have many things that can be done in parallel and sometimes you can look … series, is obviously the critical path because there is only one path but when it comes to the parallel activities that becomes hairy. Because you now need to prioritise which of those parallel paths. Sometimes that are staggered and sometimes they are not, they are all happening in parallel and you really need to look at those processes and say what would happen to your lead times? If I don't pay certain attention to certain details inside of those processes, instead of waiting for it to be incomplete and your entire production line halts because of something you didn't look at.

Michael. The main way that you guys mitigate the risks is through upfront specifications and upfront design/engineering work? And provided that your upfront engineering work is done to the correct standard then that mitigates manufacturing or production risks?

Company B. Yes. It leads to a smaller pool of risks. Other risks require you to do piloting and prototyping. You can detect risks in the design, in your laboratory but even though you have spec'd the environment you can only really close the loop once you get out there and put it into test. In the environment?

Michael. And that is using pilots and prototypes?

Company B. Prototypes and semi-industrialised piloting. That's what we do. And we feedback to that initial document we set up with the client. What does the client actually want? The client initially said they want a Ferrari but in actual fact they just wanted to be able to move from point a to point b relatively fast. To actually

delve into that saves a lot of time early one and that document is actually used, once you reach the end, to finally test your product against that. When you finally roll out your product you don't test is against a detailed specification, you use that client spec. Does it perform how the client actually wanted it too in the first place.

Michael. How important is speed to market for you guys?

Company B. It's two-fold. The one-fold is that sometimes there is competition, so it is extremely important to move fast. But the other times, in general, people don't like to wait. You can't leave clients hanging because you are trying to figure something out. So, it is extremely important to move fast.

Michael. As an SME?

Company B. As an SME, you have to move fast. And that is why if you can't move fast, I say you must Build evolution. Break up the bigger, complicated system into smaller systems and have an evolution roll out.

Michael. And that speed also means your cash flow is managed though the speed at which you deliver in projects? So, if you can deliver lots of small increments quickly, your cash flow as an SME is much for stable?

Company B. Yes, you improve the cash flow. And you improve the client because they don't have to create big budget chunks. The other thing is that we might want to give the products for free, where we keep ownership of the products and we sell as service.

Michael. Product as a service but you also have the opportunity to maintain your products to the correct standard.

Company B. Yes, because it is your product and you need to maintain it. The challenge now in Africa is that the technical teams out there that are available, where it is possible for them to maintain their own assets, can be looked at, in detail, by the OEM. So instead of selling the product with huge capital costs, you can rather offer operational costs. You offer a service where you guarantee availability. You can sell information as opposed to basic measurement data. The client doesn't want data because they still need to use excel crunching sheets to figure out what it means. So, you sell this product that at the end of the day client just wants to know am I saving money and where must I save, and how much more am I going to make. Paraphrase. If your drawings are correct and you test the product through your pilot, risk is mitigated.

Michael. Risks seem similar in your industry compared to previous interviews but there are definitely some differences. But there are a lot of similarities.

Company B. I guess if you make something, the (risks) should be the same. Software you don’t see because it is all virtual, but it is the same risks.

Michael. In closing, do you think that a semi-formalised framework illustrating types of risks and how people have dealt with them in the past would be of benefit to an SME?

Company B. I say there is definitely benefit for a purposeful, general structure from design to manufacturing. There is definitely a general risk model you can build but I would make the risk model flexible that you build a general structure but some of those items you allow for tailoring/configure.

Michael. Specific to your business and your businesses risks?

Company B. Yes. So, I believe that there is a general structure you can develop but I would make it configurable. And you could even dictate the selection with particular risks at particular stages. You can definitely have a framework but configurable with known items and with unknown items. Or a way to introduce an unknown item into the risk model. Make it technical, not financial. Something that will fast track me into a new relationship, new product, supplier, client. And you can build the model up quickly and tailor it as you discover risks. Which could be a general risk or a project specific risk. You unearth those inherent risks when you do a pilot. It should be in the minority though. We really look at creating new things that never existed. If it does exist, I would rather go to the specialist that makes it and has gone through the trouble of the risks.

Interview with Company C on 27 September 2019

Michael so the first thing is maybe you could tell me a bit about your company. What's your industries bit of background and what you get manufactured is it locally manufactured

Company C. So basically, our company does we manufacture and produce engine protection systems. Basically, most of the products are proprietary stuff that is unique to our company it's not stuff that you can go buy elsewhere. Especially on the mechanical stuff we do so as far as the mechanical stuff is concerned it's a mechanical engine protection system that consists of a fuel valve and inside components and how is it that would make the hole kit. On the fuel valve side, we have a few valves that consists of a body, piston a spring and some components to make it complete. so, a part of the fuel valve body we would outsource. we would also Stew a supplier external full stop Michael in South Africa? Company C. in South Africa most of the stuff is done local, purely because of the quantities we don't want to go to japan and stuff like that because you have to produce a 10,000 of each items to make it cost effective, to get them to actually look at it.

Michael so yours is really small batches.

Company C. yes small batches and that's why we can't really afford to buy a new machining center purely because of the quantities and volumes come at it won't be cost effective if you look at the cost of the machine and the maintenance and employing a person to do that the component would just be too expensive.

Michael. The second business owner joined the interview here. I gave him a bit of a brief update what we spoke about and now we started the interview proper and explained with what the different sets of questions are about and how we proceed. The 1st question would be why you guys choose to outsource manufacturing of some of these components

Company C. From my point of view, it would be the skills involved. And also, the cost. To produce some of the items would require a major investment in machinery, and in staff. Certain skill sets. For us it's far more beneficial to go to a specialist in that field. As we deal in in 2 different fields, we deal in both mechanical and electronic field, so we would rather go to a specialist who has the knowledge and the equipment to handle that period.

Michael so you guys get both electronic and mechanical stuff manufactured.

Company C. what we have done is well is also on our fuel valve we haven't given one supplier everything to do. We give one supplier the casing another supplier the internals, another supplier the internals.

Michael and that's to protect your IP?

Company C. yes.

Michael That’s interesting there's an actual name for that it's called horizontal chunkification.

it's where you take a single component and split it up into multiple non overlapping sections and then farm out those sections 2 different suppliers. But anyway, at the end do you consider that manufacturing as a non-core activity for your company.

Company C no, it's definitely core. Its major.

Michael so where that comes from is The IP that you develop maybe that would be the coal and manufacturing because you outsource it is non cool because it's external.

Company C, I don't quite follow you there. The end product is critical to our business so I wouldn't call it non-core manufacturing is differently key. If you can't have it manufactured, you can't produce a product.

Michael so the benefits that you guys get from outsourcing right. So maybe we can talk a bit about do you find you have access to external capabilities, your supplies are very well skilled and specialists. Do they also perhaps give you better lead times and fast speed to market that kind of stuff?

Company C. but we generally have is that the clients have quite a little time, it depends what it is the kind of manufacturing. Some of the stuff you have really done because of the manufacturing process takes a week or so make. and obviously it needs to be planned with the current production of that supplier. So, what we normally do is we carry stock and then give the guys in order for the next month or 2. So you give him an order and maybe full cast as to what you plan on taking off the next month period. Company C, I think each we have to address each product differently. What Company C is saying is true let's take care make the mechanical side, some of the material our supplier has to buy in bulk because it's special material. So, he gets it from his supplier who has to buy bulk. Whereas other items come off the shelf to stop material. Each one has to be addressed differently but either way, complete because material has to be purchased it has to be completed and delivered to him and then only can he start processing so from the time he starts to the time he is ready to dispatch to us could be 3 weeks.

Michael because of the specialist material?

Company C yes because of the specialized material or obtaining material of the shelf. We have chosen to go on birthday electrical and mechanical side with a small company where we have a very good relationship and with small companies, they can't afford to hold massive stocks of raw material. The same with us. This is why the supply chain works very well.

Michael and the cost of manufacturing external versus trying to bring it in-house as an SME how does that affect you?

Company C. I don't think we've really done the cost because purely for the fact we know that. Say for instance we knew we had to buy one of these big CNC machines that could do our job in say a weeks' time, and we wouldn't have the work to keep the machine full because of the small batches. Alternatively then what you would want to have to do if you wanted to go that route, is fine more product that you can put into the machine to make sure that it runs cost effectively and obviously you have to employ a person and keep that person busy so at the end of the day it becomes more or less out of our scope . Company C I was going to say it would change our company. We specialize in vehicle temperature management systems it's our four-day period machine shop is not so we would rather use someone who has that specialist knowledge

Michael and the price of these goods that you get from your subcontractor for manufacturer does that affect you as an SME or do you feel like the pricing is acceptable? I don't think I phrased that correctly, so the purchase price of those goods how does that affect you as it is me?

Company C of course it does. We are buying a product and we have got to add value to it and then we're going to sell it on. So, the price that we buy it at as a major effect.

Michael and do you think that these manufacturers can produce the goods for you at the lowest possible cost because they are specialist manufacturer and have potentially fall order book?

Company C. what we also tried do is have instead of doing a month to month pricing, we try the contract with the guys and say to them we're going to buy let's say X amount of these products every month and we would try to do that period and is there a price that you can try fix for the year so we try and fix prices. So, what he would obviously do is work it out and maybe have a price increase based on his industry such as steel inflation aluminum that various exchange rates and all that stuff that those guys have to contend with. So, if we can fix the price for a year at least we know what our costs will be for the year. And we can increase our selling price on those costs. Company C is a second benefit that we did. It's that if we can give that guarantee too on future business, to the electronics supplier and to tell them that we going to continue taking an estimate that you're going to take for example X amount per month period they don't produce a man stop. They produce 6 months. So, they production run becomes much more viable. They set up time. The supplier will have a series of PC boards manufactured and he will go ahead. And we would say we want 60 this month for the next 6 months but he would go ahead and manufacture 400 and one girl. So, his set up time is amortized over 400 as against 60. So, it makes him more profitable which they need he can pass on to us. And the same with the mechanical side it's all done on NC lays and machining centers same thing applies. He does not produce 30 he produces 100 because once he has set up, he just let the machine run. In fact, sometimes he's not even there the machine runs overnight. He cuts all the material and it's fake to the machine and it sold fully automatic and he will tell it to make 5000 tomorrow and tomorrow morning is 5000 on the floor.

Michael and hopefully there weren’t a mistake in the coding?

Company C yeah obviously it's been checked by him. and working with these small suppliers we have developed that relationship and he would get to know what it is we require.

Michael. How long have you been with these particular supplies? how long is this relationship in in place?

Company C on the mechanical side call my I started with the sun's family. Is retiring, in excess of 30 years. Unless with the electronics. The electronics is 12 years.

Michael so it's interesting with the previous guys asking I've also spoken a lot about relationships with their subcontractors and how that helps them manage all the risks that come about. Is there any one of those benefits that particularly stands out as being the most important for you guys?

Company C, I think the most important thing is that, apart from the supply today and that supply tomorrow, you know it's very difficult to deal with the guy if you haven't got that relationship. The people know what your requirements and criteria are, the standards that you need all, and if you've built that relationship the people tend to not take chances. Because there's a good amount of trust between the parties. Whereas if you going to this new engineering shop he might have undercut the garden price but you don't know if he has sacrificed anything in quality and stuff like that period and at the end of the day the product goes off to the field you need to know and trust that what you have sent out will do the job that you have manufactured it for . If the guys manufactured it substandard, you can start getting comebacks. And that costs money and reputation damage. Is that product is faulty in the field they don't like the manufacturer they blame us. They look at the product and they've said that company that name. You know if it's "product name" they say I know those new prevents an I know they don't last more than 3 months period it's very critical. so sometimes you need to sacrificed price so that you get the right quality. It's not always about price and price is key but it's not always about price. Especially on the mechanical side there are parts that you can never really document, we had a problem with the surface on a particular component , and we've got that now to exactly how we wanted like to try and document what we've done finish and to put it on the drawing is very difficult. but again, it's because we have got that relationship. so that's the benefit you get from building that relationship with the supplier

Michael so the second half of the interview revolves around the problems you've experienced when you outsource your manufacturing and to start that I wanted to ask that as an SME who outsources your manufacturing, how do you define risk?

Company C. well maybe a part of your question answered it. I'm not sure maybe part of it is that if your manufacturer isn't able to deliver in the required time. Sure everyone should have an open channel of communication and say to you I cannot deliver because I have something that has happened an my supplier couldn't supply me for some reason, or you know there's a big strike in the metal industry and we can't find any product . So that is a vigorous so at the end of the day you can't get the product supply your reputation and stuff comes into play. One would ideally like to carry stock, but you cannot carry too much as an SME need? Yes, because you're tying up money. So, you've got to try and find a balance between having enough stock and maybe trying to weather the storm. But at the end of the day if you run out of stock and your supplier can't supply big business actually suffers. The biggest risk as an SME That works on the just principle a lot and It can backfire. Company C. yes most definitely. Company C we have a special material that is drawn from our supplier for us to our specifications and that comes from a big company come on man, and their

attitude is very much you just stand in the queue and if your delivery is late well then tough. And that effects everyone down line and that is the biggest risk.

Michael in terms of budget and cash flow, placing these orders this is how much money is in a SME and you have available. You mentioned you manage this through fixing the price for the year so you know what the cost is going to be for the next 12 months period. Company C. you can sort that out. Michael have you experienced problems with quality from your subcontractors?

Company C. Yes, we have. But it's not a major thing. Yes, we have but because of that relationship we have built with our suppliers it's very quickly and amicably results. Because if you have given him a spec and he hasn't delivered as per spec obviously it is going to influence your product and when it comes and when he believes that he has done it as per your specification find out when you do your quality checks that there is something different. Obviously, something has to be rectified remanufacturing so there is going to be a time lapse in it, and you need to try have some buffer stock to absolve that so that it doesn't affect your supply. Company C you also need to build in a strong quality assurance for every product that comes in whether it is a finished product, it must still be tested to conform to our specifications , and if it is raw materials we come back as laid out simply out in such a way that there is a check at each step. On conformity. So, we have quality and conformity right through to the final Test. We try eliminating any of those problems before it gets to the field area

Michael. So those quality problems you have mentioned, there are not a lot but as in a semi do you find legal protection of any news. So, setting up a contract with the supplier wait he has set up a quality product and you pursue legal recourse? To try solving it.

Company C not necessarily

Michael that confirms what everyone else has also said.

Company C, I don't think it's big enough to warrant going down that route because that's going to cost you a lot of money and time.

Michael so it would take a lot of time to rectify the issue.

Company C. that's where the relationship comes in. I think it works all the way through Michael from your supplier to us to the customer. If you have a problem, you pick up the phone and you know that we will be on site within the hour to resolve that problem. It's a far better route to follow then too. It's like the old adage you

can win an argument but loser customer. That's what would happen. We would rather climb in and get involved and resolve the problem with our suppliers. Because we have that relationship.

Company C. and that's where the relationship is key. It's understanding what the customer wants and if the needs change how can we adapt. I think in these times people, not all people realize how important the custom is. Because that's the guy who keeps your doors open. For SMES you lose 1 customer it's not a percentage it's a major percentage it could be 10 or 15. Because not everybody has 20,000 customers. Everybody is important. Every link in this chain is an important. We should all work as a unified group

Michael how involves do you guys getting new supplies operations?

Company C. try get involved as far as they will allow us to create obviously if they have the stuff that they tried to protect as well so wherever possible try to get involved when there is a problem. So, we can see where we can improve, if we have had a failure, on the design side. Or say we have this system that is lacking something, and customers says they are continuously losing transmissions you are protecting my engine but I am losing transmissions, so can we, if there is a possibility or opening for us, get in and see if we can add value .

Michael. And they would, you had mentioned if there is a problem, and that early notification of the problem, call Matt would be based on what your relationship. He would pick up the Phone and be like Hey guys we have just picked up this on the production line let's sort this out.

Company Cor obviously when the product gets to the end user and the product keeps on shutting down we would be the first guys to get there and we would identify why the system is giving us problems and get onto the Phone and see if it is a product issue or if it is a ventilation issue. Company C I do quite a lot of development work, and notice that there is a problem with a particular material, we continue testing with this material but we have already working with the machine shop as they have said well we can change it to a different material but let's prove the concept and then look at the new material , that sort of thing. And that is from the involvement with our suppliers and his knowledge. Michael is specialist knowledge. Company C. you can often go to him and say I need to design this, and this is what the customer wants how can we turn this into a finished product? And he will have an idea and can help you to do it right, double he will look at it from a machining POV and will look at the most economical way to machine it. He might say move that today and then I can machine it very easily and it will be cheaper. And that's because of the relationship.

Michael and just to confirm out of all of these risks that we have just spoken about what I heard is that the biggest one you guys keep your eye on is the delivery schedule?

Company C delivery and quality. At the end of the day you can have a whole shelf of finished product and if it doesn't go out the door it's a problem. Customer has a perception of to what he needs and when he needs it you need to stick by it. Because at the end of the day if the customers stopped buying end you have continuously delivered it late. the risk goes all the way down the line or up rather if our supply leads us down, we end up leading our customers down. And there is a problem Lee. So, it's supply and quality. And obviously service and after service that's one thing that we pride ourselves in over all these years is that it's one thing delivering a product, but you have got to continuously make sure that the product is working and that the customer is happy. And if there is a problem how do we resolve it. Timeously. and that goes back to our suppliers. It's not only 2 from a machine shop where we are buying stock items off the shelf, and they can let you down badly as well. Because you go month after month after month buying a product and you make the assumption, which is very wrong that the product will be there, and one month you go there and you say I want another few and they say no stop. It's big for us but for them it's very small. Michael so they don't care. Company C yes it will come in the container and that contain is only going to be here in a months' time and then it has to go through customs. You will be in trouble. You are in big trouble. You have to have alternative suppliers you can supply you even if you pay a premium price if we have got a backup. You have always got to have a backup.

Michael. So, managing these risks such as quality and delivery schedule, you manage that through having a good relationship with your supplier? So, you depend on him to let you know if there's a problem with the delivery schedule early, or if there is a problem with the quality so you can jump in and see how you can fix it is that correct?

Company C. yes.

Michael as an SME do you have a formalized method for managing these risks question mark is there any Company C. documented? Gut feel?

Michael it can be gut feel.

Michael you know if something happens in a typical is there a typical process that you would follow? It can be semi formalized?

Company C. semi formalized. Yeah like I said we don't have a formalized for instance call my suppliers or an alternate supplier, obviously you won't have very good relationships with that supplier because you only buy from him every time there's a problem. You got to run to him and say please help us out with her period and he helps you out but then you don't support him again. So, the next time you go to him he's going to be like. Yeah, it's just important to make sure you Know what's going on in the shop. For instance, the Packer,

and you in your stores needs to know that then when it gets to that minimum stock level, he needs to make somebody away. The manager might be aware he might not be aware. He might be doing something else. Cause it is small and you're trying to cover many areas you might drop the ball. So, you rely on your stuff. They've got to be in touch with what they're doing that's a fast mover that's a slow mover. the staff is aware if there is an order pending or if there's not. So, it's not just up to management. It's every staff member actually needs to know that they are key. They as important as anybody else. Without that person that job is just not going to happen.

Michael I was just thinking you guys manufacture in house as well as external, do you see it as a much more complex process working with external fabricators as opposed to doing it internally, is that something you consider?

Company C I would say it was easier. Company C. it is easier once you get the process going. But to get and you supplier you have got to school him as to what your requirements are you can give him a document with a drawing saying that's what I want but you actually need to tell the guy when I'm saying this , when I placed the order doesn't mean I want it on the 25th it's an estimate we need to be flexible. We don't want late , don't supply me the order on the 25th because what I would like to do is get it on the 15th so I can have some time to sell some of the stuff before I have to pay you so it's all to do with cash flow. Cash flow is one of the biggest issues is an SME. If you don’t have any money to buy stuff you aren’t got anything to sell. It just goes back and that's the relationship you have to have with the supplier, not everybody can buy COD. If you've got an account you can get the product in sooner rather than later, and that will help with the cash flow.

Michael how much do you guys think that your personal backgrounds have shaped how you approach these risks?

Company C, I think that it has helped a lot because you know myself and Company C, we have been doing this type of job for 24 years and Company C has been doing it for 35 years. And nothing can take away experience. There's no substitute for experience. That gut feel. You can have a computer that says that's the that's that, the computer doesn't know hang on that was a spike and you need to just ignore that and smooth it out a bit. Because you want because you had a rash on the floor and other system says hang on we need to run out of stock order more and more but at the end of the day you don't need it because you know it was just a spike and you can ignore it. Company C, I think experience plays a big pot. Also, the fact that Company Con I am also not only office bound, so we are out on the road. We have a good picture in our minds of what is happening and what is likely to happen. Let's say thermal is going to build 10 machines of our special units I know that I need Tina items that we perhaps use one in six months because they are special thermal. But now I know that they are team coming up so I can plan for it.

Michael because you have a good relationship with your customer?

Company C yes

Company C. it's two-way track traffic all the time. If I don't plan production because Company C didn't tell me they placed the order and expect something to happen because we said 2 to 3 days for delivery and now this new product, we've designed a new product. We make one or 2 prototypes and we haven't given our supplier lead time yet it's just not going to happen. At the end of the day he went out and made some promises, maybe didn't come back, and gave us the information to get the thing in motion. Get the stock get the stock the customer needs. It's communication you have to have that communication it is key.

Michael in closing , do you think a framework combining what you've given me as well as what the other companies have given me and literature suggests would be managed for managing these risks Call Matt do you think this would be beneficial to industry and to SM ES in South Africa ? How would you?

Company C, I think it's a good guide, but each business is different, and you can't go. We've had a couple of guys come in and say you need to do this that and the other but they don't understand the business, if you don't understand the business, especially if it's a unique business, we are selling specialist field equipment . There is no Manual for that period

Michael you have unique risks, unique to your business and to the niche market you are serving.

Company C, I think depending on what that information is there is always something that can be taken from it. You have got to read through it with an open mind and know that some of the stuff might not work for you but some of it would. Company C. it would always be good to have let's call it a skeleton and you leave it to the business to put the meat onto that skeleton. That it would eventually suit your business

Michael yes that's more or less what the other chaps have also said.

Interview with Company D on 02 October 2019

Michael. Just to start please could you give me some background of your company? What is your value proposition, and which markets you serve?

Company D. The company was formed in 1966, focusing specifically on sheet steel. It changed in the 80s and 90s towards construction. With products in the background, not the focus at all. Subsequent to the construction industry taking a turn for the worse, the business went through some ownership changes. We revised the focus

to say let's exit construction and get back into products. To develop appropriately to service the existing market, which is predominantly biomedical and safety and so on. Presently we find ourselves in a position where we have weathered the storm of rough economic times and are in a much more comfortable place in that we have a lot of customer demand. The phone is ringing. I'll be honest, compared to my neighbors, it is a rarity. Literally everyone around us was on short time while we were running 6 days a week overtime. we have had some good times in the middle. Anyway, what we do is that we are a sheet steel business focused on manufacturing sheet type products from sheet material. We in-house cut, bend and shape all the way to paint whatever its corrosion protection needs to go. And subsequently assemble to deliver countrywide and we have added export codes recently, and we are romancing customers cross border. For the time being we are in housing manufacturing probably to the tune of about 80. What it is we outsource items we cannot make, let's say not out of sheet steel items. Broadly speaking that is the items we would outsource. It is critical to us because, besides the fact that sounds like a 20% doesn't sound like, every single item will get one of those. There is not one item we send without an outsourced aspect. We will simply never be a completely insourcing company. For our new products that outsourcing is generally larger. Michael. this is to generally local companies.? Company D. yes very much local. We were proudly South African in capacity in 2017 for the first time and we have renewed that in our second year. We showcase at the proudly South African summit. We did that this year. It’s at the Sandton Convention Center and one of the prerequisites is to make sure that part of what we purchased comes from South African. 99% of what we buy is from this country. We only sell to local companies right now and they are conduits to other parts of Africa.

Michael you had mentioned that one of the reasons you outsource is because you don't have the internal capabilities? Company D. correct. Are there any other reasons that you guys would choose to outsource apart? Company D. Definitely, speaking from a time point of view. If we can make it but not yet make it then we would definitely outsource it. There are obvious things we don't make, paint, but we consume it. There are obvious things of that nature. And there are less obvious things of that nature. Such as sheet metal items which are cutting complex patterns which we can't achieve, so that would be capability driven decisions.

Michael. leading on from that question, for those parts that you outsource do you consider that manufacturing as non-core? To your business.

Company D. Define non-core?

Michael. I guess as an example previous company I interviewed for them IP generation is core. To them manufacturing was not core but the generation and retention of the IP was core.

Company D. I think from our side that our intellectual property and proprietary designs: yes, we only in source. Maybe we would outsource would be dumbed down versions of that IP, they would see a part. They

would not understand its larger impact on the business. Defining what we didn't do, what is the purpose of the business, making sheet steel, anything not making sheet steel products is non-core. That would easily classify what we would outsource, to that category is non-core. But I would say that it's like. How trite is this going to sound? But we don't buy things that we don't need. So, everything is core. To give you any example: keys. Keys and locks. That is an outsourced item for every single cabinet, we cannot sell a single cabinet without a key and lock. So, we have very specific arrangements in place regarding how the suppliers maintains his stock levels. We've actually gone to the level where, on his ERP system, we have line of sight as to how he manages his stock. And they converse with us on a regular basis to say if they are tracking correctly. That is core for us to manage, from supply chain POV, the product, non-core. but risk very very high, value very very low. So, the opportunity cost of failure, through the roof.

Michael. So, you had mentioned thank you track your suppliers' inventory, how do you guys manage your inventory as an SME?

Company D. So, we try and focus on, we do it from a pool POV. it's a Kanban situation or a derivation of that. Where we are looking at the customer demand and understanding from a demand point of view what must we manufacture. And manufacturing theory on the floor tries to focus on the Kanban approach which is to say individual areas then, subsequently, feed backwards what they need in order to accomplish their job in the given time. And that's how are forecasting methodology is to say we know what's going to sell, irrespective of customer demand on hand, we don't really react to that period, we react to current trade.

Michael. how far ahead do you forecast?

Company D. About a month. That's about what we can do at the moment. What we sell usually goes out in the same month of purchase. It's only the newer IP that are going to incur a larger lead times and a bit more complex approach.

Michael. What benefits do you think you'll company gates from outsourcing manufacturing?

Company D. very little. I must be honest with you; I think what we struggled the most with is with suppliers who don't bring the parts. Michael. is that a delivery schedule? Company D. it's a delivery schedule thing and understanding us thing, buying power thing, if you look at the buying power of a small to medium enterprise, generally speaking you are back of the queue when you need assistance. Even though you might be a good payer and a great customer to deal with and nice people etc., you, generally speaking, can't command the degree of focus that an SME requires in order to be agile in the market. And SMES without that agility don't survive. There is truth to the term: Businesses don't compete, supply chains do. I think supply chain design from my POV , for us, I would love to in source everything, with the obvious tradeoffs being, naturally, that

we would have more costs, more people, bigger overhead structures, more risk, high stock values, decreased cash flow. What we try to do is actually isolate aspects of what we currently outsource, and we try do a bit of a long-term analysis and say what would it take to insource it. And hence, overtime, we do more and more and more insourcing. And it has worked for us. And it's prevented us from seeing Cash bleed out into the market and not necessarily retained here for better use. My staff, in general, are keen for the training. So our guys are multi skilled, not that I pay everyone a general rate and don't have specialists. I do. It's just that we, fundamentally, as a team understand that if someone need is needed over there the guys get stuck in. And they know they have been taught over the last few years that getting stuck in actually skills them. So, while they're there we're going to train them, so that we have found that, over time, We have not needed more people, we have needed less. So even though we have lost one or 2 due to attrition we have had guys we have had personal issues. But on average sort of between 10- and 20-years average 10 years. We don't lose guys. We take care of them and they take care of us. Times change but what that is made from an outsourcing POV we have an aversion to it unless we cannot make it ourselves.

Michael. those companies that you outsource your manufacturing too, how long have you been doing business with him?

Company D. Some of these companies 40 years, other companies as short as 3 months period and, hence, that talks to the last 3 years of the company's history because of the nature of the change that we have had to undergo to restructure out of construction in 2015/16 and only focus on the product's. That taking out of construction flawed this business, it was 70% of its revenue. It was cut off; it's not just cutting off a limb it's cutting off 70% of the body. So, having an arm and a heart and a lung and that's it and saying live. That 30 to 35% of what was left both in revenue and product base. add to very quickly understand how it's going to remake itself. How it's going to reposition itself going forward? From my in-house branding point of view. How is it going to make money and how is it going to rain, when you have this facility and you end up taking your money and giving it to another supplier, you know that within a month I can probably do that in here, has made that journey we have gone has been lessened is outsourcing and more insulated

Michael. That's very interesting.

Company D. We have gone the opposite route of most people.

Michael. something the previous guys have done, you have mentioned that you guys struggle with not getting enough attention as an SME, when you outsource to searching suppliers. And some of the other chaps I've spoken to, how they've managed it, is through relationships. So, they build a very strong relationship with their supplier and, through that, they are able to skip the queue and will get preferential rates, etc which is quite interesting.

Company D. Agreed. I 100% agree with that. Supply chain management, one can go into the textbooks and the theory and look at understanding the terms I will go and say we're running a just in time process or lean, one of these sorts of arbitrary things. But you cannot beat out knowing the guy who supplies you. Michael yes. Company D. you were present now with the guy I've never met, who is now supplying us with something for a very high in product, which a customer is still phoning me about, in the middle of this interview. So there is high high pressure, there is the supply who had screwed up, this week. so the opportunity for me to meet him is there but the opportunity to meet him and convert them into loyal capable supplier, we're going out of our way now 2 machine something for him that is going to give him the ability to cut a radius. An ability that he should have, inherently, as he gave me the quote and because I bought the product. Michael. And you gave him the spec. Company D and I gave him the spec. The drawings come at the whole picture. So, if you look at that silly example, our ability to leverage the next jobs, faster delivery, etc. We have now been the guy who's helped the supplier.

Michael. So that is a quality issue you've had with this chap right, now you've managed that through getting involved in his operations. Company D. correct. Michael. Is that something you would often do if there were problems?

Company D yes. We seldom find ourselves dealing with guys much much smaller than us. Because irrespective of the people, we have the facilities and quantities and so on. I still think we are on the small to medium end. Probably closer to smaller than medium in actual fact. So, but what we have that others don't is that we punch way above our fighting weight. And that comes from a skill set POV, very seldom will you find a business this size which has the leadership at the Top, granted is it is myself, it may sound trite and possibly self-serving, but it is reality because I've seen it. The reason I got involved with this business is not because it was my only option, it's because I know that by bringing in the amount of knowledge and experience that myself, my wife and others have to it, the competitors in the same space cannot leverage that. they cannot leverage that. my wife is halfway through a PhD in accounting so from a finance point of view she sort of breezes through, the focus that she brings and conversations that she has with FD's and CFOs of much larger businesses, people sort of sit back and take note. It's not about their business account that she's having a conversation about, she has simple conversations within that she finds intriguing about their business. And all of a sudden, the CFO say well are you know this. and Company D, this is how we operate with. with people that were involved with massive businessmen. And subsequently we parted ways, which I'm very grateful, because there micromanagement wasn't necessary. So I think when you talk about relationships, I have gone off on a hell of a tangent but I'll bring it back by saying if you're not friends, because friends muddies is the water, but if you have a solid relationship built on trust . I'm leaning on you Bud and I need you to help me. Inherently, supplies in say I'm in a position of trust now let me be trustworthy and they will meet you halfway.

Michael it's true. So, I've only been working for 5 years. I've had very adversarial relationships with suppliers. So that relationship was not ready there. Company D, it doesn't work. Michael as I go along, I see the importance of relationships. Company D, it defies belief because you are educated through, but undergrad did you do? Michael mechanical engineering and this is an industrial Masters? Michael yes. Company D, when you start getting into those conversations with experienced lecturers, you start to have that conversation about engaging with the subject matter in a manner that you can't do in undergrad. These concepts are arbitrary, mostly this is supply chain management, it misses how you manage procurement, this is how I'm going to do things on a financial level, I'm going to find my supplier once a month or whatever the case may be, this is how things Or real life at run . Clockwork. until the proverbial ship hits the fan. Then all of a sudden, that educated way, it doesn't work. Because there is nothing shall we say connecting individuals. All you have is the relationship and I would argue strongly that relationship management and supply chain is more valuable in general, than pure processes.

Michael. I agree fully. Having done a mechanical background, what you have said about operations is very much the same, it's very difficult to link theory that should do in undergrad with practical work that you do in real life. Things are very different. Company D. Yes, it's good stuff. We are all on the same boat to learn. Michael. Yes definitely, so I wanted to ask maybe how you as a business owner, define risk?

Company D. I would say risk is in 4 quadrants. You can almost draw it based inherently on 1 off 2 things the value of the purchasing. this value is a percentage of my product or operations so I can value risk by juxtaposing these 2. To get it wrong, the high-risk band, for instance I value losses. One can look and say it's independent of value and it's more to do with scope of supply, limited scope of supply. Value is irrelevant, I need to get the quality period, or I need to get the certain skill set and it's simply not available. The risk of not having a solution is failure. So, it's almost binary in that context. I would say that that, I view risk in both worlds, because I simply don't think one can Sort of have a singular view and when we have buying decisions that are high risk. I defined in terms of: can we do without it or if we do Without it, next. And if we go with the supplier, we go to another decision tree and that decision tree has to breakdown into his strength and weaknesses and capabilities, our ability to leverage a possible relationship or his scope of supply being damaged then damaging us and its effect. So, generally how I look at it, it's fairly softly defined because I know one of your questions is going the route of do you have a formalized method for managing risk. We will get to that. have I answered your question?

Michael. Yes. We had mentioned that you guys occasionally have quality problems when you outsource manufacturing, all day any other problems that come to mind?

Company D. From an outsourced manufacturing point review? Yes absolutely. sizes don't fit on occasion, for obvious reasons. And objective failures happen in the way that the country has been run at the moment, you find that supply chains have been shaken to the core and their expected lead times have been pushed out. And you find that as a result of that it's very very difficult to manage to your customer the reasons why you can't deliver. People don't consider Tier 2 or tier 3 of the supply chain, they only consider the first person. I think that our risk has been the damage in the customer base cause our suppliers have dropped us. Definitely.
We then proceeded to go on to the shop floor where some products were due to leave the previous day and were not completed. Company D proceeded to organize his stuff into a small ad hoc production line. With 3 to 4 stations an employee's working at each station on specific tasks in a semi-automated slash manual process. I believe that the goods left shortly afterwards, after his intervention.

Company D, carrying on. Where were we?

Michael. You had mentioned delivery schedules is a risk that you guys see how when you outsource, do you see the budget and cash flow problems? Does that effect You?

Company D, what we see is that if we don't dovetail our procurement decisions with our expected delivery time frame, in other words, if you are buying something with and expected payment terms of a 30 day account, and you don't deliver within that time period, you find that your incoming cash and your outgoing supplier cash don't match and you are left with the difference. So, from a cashflow management point of view, I would say that outsourcing anything has a massive impact on cash flow and obviously the selection of suppliers, the ratifying of those suppliers, having them on an account as opposed to a COD basis is quite important. Very.

Michael, we had touched on in before we started but loss of control of your IP? Is that something you guys see as a risk?

Company D, no, we don't see a risk there. Inherently, our IP is capability driven. I won't say that is the reason we don't see a risk. I think our IP is never outsourced in its entirety, so one cannot see a connection between outsourcing a part and someone realizing what we are doing and benefiting from it.

Michael. There is a term for it, I think it is horizontal chunkification. Company D. OK? Michael, where you divide a part into non overlapping components and farm out different components to different suppliers. So, nobody has a full picture of what you are building. Company D, I would say that makes a lot of sense. Michael, that sound like what you guys are doing by sending out certain components? Company D, ja, it is.
Michael. Out of all of these things we have spoken about, are there any that you particularly pay attention too?

Company D. You know, I would say it is the cashflow thing. I really do think so because IP is not the issue, time definitely is, but they are inherently related. Cashflow, cashflow, cashflow. Michael. Quality? Company D, ja, quality is there but I think we don't just look at quality and just hope it is there in the end, it more like, when we manage it, we manage it with very simplistic receiving processes and very simplest check lists. Because we are not making complicated internal combustion engines, we don't sit with the need to have ridiculous check equipment on site or anything of that nature. So, we find that, with our outsourced components being so simple, generally, also fit for purpose, generally, Simple checks at the entrance, delivery, should prevent that from contaminating the shop down the line. Then staging that further back, when we have control over the design, we have an internal review process and it is signed off before it is supplied to the supplier. So, we have generally run one or two of these samples. We try, before we make the decision to outsource something, know what we are doing better than the supplier and when they come along, we can criticize very easily.

Michael. The next set of questions was risk management strategies a how you manage these various risks, but we have covered that as we have spoken about each one. So, I would prefer to move onto that formalized methods question?

Company D. So, I think where formalized methods are concerned, what we formalize on are things related to the capability of the supplier, the pricing of the supplier, the location and delivery times and so on. So, we do have a formalized mechanism. Should it be termed something like how Mercedes does it? No. its more or less a combination of industry experience that we put together into our list of criteria specific to our business, when we go out to market and start looking for different guys, we are also not dealing with super complex things. So, the questions don't need to take three months' worth of auditing and screening. Which we have to go through when customers come and visit us. The screening report which I have just completed now, and go the results last week, things related to … you must sign the UN global compact. So, there is really complicated mechanism people are employing when farming out to us, when we are an outsource decision for them but from our side, as you consider the supply chain vertically, the customer at the end has the most complicated product. Where we sit in the supply chain is where we are a component off or we are housing off, so we are fairly simplistic in respect to our current customer base. And one tier down from us is pure raw material. So, what are we going to do in the raw material phase, quite a lot I might add, but it's, the outsourced things are case by case and certainly on items that relate to specific products. Items that relate to all products and have a common use, they go through the most complex ratification process where we will run samples, inspect data sheets, go though things very technically, have training and if, at that point, even after having received training from certain suppliers, on the use of there products, we still reject because we need to know if we are going to get the support. Are we dealing with a proper part.

Michael And I guess, linking straight into that, is how much do you think your personal background has shaped how you manage risk?

Company D. About 89% (jokingly). I would say all of it. I would say in the last three years, everything has come as a result of my involvement. What we found when we got this business, is something that was lumbering along because of the way it used to do things and because of the way we used to do things mentality was precisely why it was on the rocks.

Michael. Previously, the question here was: do you think a framework combining best practices from industry and literature, about the risks and how you manage them, would be beneficial but what I would rather ask, having asked this question to a couple of people already, what would be beneficial for you, in terms of risk and risk management strategies and a framework for your company?

Company D. Would it be beneficial for a framework that does not exist, coming into existence, be beneficial or specifically for a style of framework? Michael. I developed this framework; would it be beneficial? Company D. I think, the framework side of things is a high-level view that only has benefit for the next level to come. Anything qualitative, first exploring a field, like you are, certainly in the context of a south African base, the value in the framework is only going to be beneficial for guys of a similar educational level as yourself. I think the problem becomes the accessibility of the steps necessary to achieve some results against that framework is where the real risk is. I think that where employees themselves are the risk. Frameworks aren't going to get an employee to do anything specific. They are great from a training point of view but how a supply chain works is largely a function of how the rest of the business works. I think, not coming to a point of saying there is no answer because the problem is complex with so many things to consider, the framework needs to consider adoption.

Michael. From an employee level?

Company D. From an employee level. Obviously not to the ground but employee level to the procurement space. Having something that people can understand. Frameworks are one or two pages, flowcharting, pictures, whatever. Michael. Matrix. Company D. I think, as an academic exercise, fantastic but as a practical exercise, it has limited value unless it can be translated into some form of training or accessible slide or something. Not that that is the out put you are looking for, but I would say that frameworks die at ideas level. I think, looking at the way that this country is run and looking at the risks we inherently face, not just as SME's but as an industry/sector, it is in dire straits precisely because people don't understand the risk management part of their supply chain. I can give you a hundred ways our customers deal with us and they never penetrate the deeper levels. They are not worried, it's like you are a black box. So, you as a supplier must supply. I give you order; you must supply. This is how we work in this country because that is how it

works when you walk in spar or woolies, same as when you walk into BMW and you want a car. That's it. But in the mSME space you have got so much less capability, initially. But if that thing was part of a larger supply chain understanding over time, I think our SME space could grow. And become like these guys who behave like black boxes. The SMEs here, 24 to 28, something of that percentage of businesses in our country are SME's whereas in the first world it is 70% plus or higher. So, for me it is a huge passion to see this work. Michael. Everything I have studied this year and last year I have really gear it too technical management or I want to open my own company. Something one of the other guys had said is that what it could do is help new entrants to the market ramp up quicker than going through the pain of experience. Which I would hopefully see myself as one day.

Company D. Yes, I agree with you. I think if you are going to learn from people's mistakes, all the better. But nothing will remove the pain of experience because when people are dealing with people, it is unfortunately people doing the job. And no system or framework can take account for the fact that someone had a divorce and simply did not process the paperwork.

Michael. It's the truth of it. Company D. Yes, very much.

9.7 APPENDIX G: INTERVIEW ANALYSIS

This appendix highlights part of the thematic analysis of the interviews. The analysis was grouped in themes with extracts from each interview colour coded according to company. The analysis sheets contained a vast amount of information and reducing it to be legible in a word document is not practical. Thus, the depictions below must be for illustrative purposes only.

Thematic analysis of Theory Question 1:

	Focus on Core competencies	Reduced capex and Opex		Access to external capabilities	Increase flexibility	Decreased time to market	Manufacturing is noncore
What we try to do is actually isolate aspects of what we currently outsource, and we try do a bit of a long-term analysis and say what would it take to insource it.	amount of capital required to set up manufacturing operations and achieving a certain critical level where you actually run it profitably. Volume of products not sufficiently big. SME's seem to run relatively small batch's	build it at a lower cost than trying to do it yourself	small batches and that's why we can't really afford to buy a new machining center purely because of the quantities and volumes come at it won't be cost effective if you look at the cost of the machine and the maintenance and employing a person to do that the component would just be too expensive.	so as long as you have the right team building it.		This is spoken about a lot in TQ2	The performance of the product is core.What's more important is the spec and quality control. Quality is important
Times change but what that is made from an outsourcing POV we have an aversion to it unless we cannot make it ourselves.	you really don't wanna get involved as it will eat up your management resources	no reason for you to get involved 'cause you can't do it any cheaper yourself	And also the cost. To produce some of the items would require a major investment in machinery, and in staff . Certain skill sets. For us it's far more beneficial to go to a specialist in that field	most important to us would be the level of experience and skill in those undertaking the work		so if you are able to build up those relationships and have part of that work and you have guys who will do you believe will deliver against the spec you put in place in the time that you requested that is then very important 'cause then you can use your limited resources to bring in additional revenues. Use of realtionships to manage speed to market and quality. Also links to monitoring and reporting. All these guys do JIT manufacturing which is risk assumption.	delivery of the value proposition is core. manufacturing is not.
We have gone the opposite route of most people. Moved towards less outsourcing	you only really want to bring that in house if you see an opportunity to generate significant capital as opposed to investing that money somewhere else	either take time to build internally or cost money to bring them on board if they already had the knowledge	, I would love to in source everything, with the obvious tradeoffs being, naturally, that we would have more costs, more people, bigger overhead structures, more risk, high stock values, decreased cash flow	Yes, they are the best at it and they have got strong relations. It becomes their core business (viz. not ours)		I do look at local partners and if the are too expensive and cannot handle the lead times then I go out overseas	It becomes their core business (viz. not ours).
	you can use your limited resources to bring in additional revenues	right relationships you can then build it at a lower cost. Realtionships help manage costs		by outsourcing it we can get the best partner that focusses on that manufacturing portion and you get all the benefits. You get the best machines, the best workmanship, the best quality, the best workmanship		The one fold is that sometimes there is competition so it is extremely important to move fast. But the other times, in general, people don't like to wait. You can't leave clients hanging because you are trying to figure something out. So it is extremely important to move fast.	our core business is to not manufacture PCB's. Our core business is too actually design and create the pcb and then to have this manufacture facility produce it
	Dennis I was going to say it would change our company (viz. to a machine shop if we inhoused everything).	So with measurement systems, its not bulk. So it doesn't help to set up a plant. Selwyn said something similar. Find quote from him. SME batches are too small to justify a manufacturing plant.		From my point of view it would be the skills involved		As an SME, you have to move fast. And that is why if you can't move fast, I say you must Build evolution. Break up the bigger, complicated system into smaller systems and have an evolution roll out.	we focus on creating the idea and putting it into practice. The IP. Prototypes and testing the concepts in an industrial environment. So if somebody else is handling the manufacturing, we don't have to take out the initial capital and we don't need to take out the resources to be able to manage and ensure that the manufacturing portion is up to our standards. This speaks to capex requirement, focus on core competencies and access to external capailities.
		. When it comes to the clients we deal with in the market, to comes to a price crunch. Need to produce at the lowest possible cost. Low cost gives access to short and medium term budget.		To produce some of the items would require a major investment in machinery, and in staff . Certain skill sets. For us it's far more beneficial to go to a specialist in that field		from a time point of view. If we can make it but not yet make it then we would definitely outsource it.	it's definitely core. Its major. The end product is critical to our business so i wouldn't call it non core manufacturing is differently key . If you can't have it manufactured you can't produce a product.Ie manufacturing is core.
		if number and price can compete with the market in which we operate in then we will gladly build up the local facilities		We specialize in vehicle temperature management systems it's our fourte. machine shop is not so so we would rather use someone who has that specialist knowledge			what is the purpose of the business, making sheet steel, anything not making sheet steel products is non-core. Ie manufacturing is core.
		SA companies are always much more expensive than our china partners. So that why we always tend to go to china unless government forces you too (viz. go local), then the price is significantly a lot more.		And that is from the involvement with our suppliers and his knowledge. For prototyping			But we don't buy things that we don't need. So, everything is core
		I do look at local partners and if the are too expensive and cannot handle the lead times then I go out overseas.		What it is we outsource items we cannot make, let's say not out of sheet steel items. Broadly speaking that is the items we would outsource			
		the quantity and the ... Michael, the capital requirement? ... Yes, there is a capital requirement to start it up but it must be sustainable					
		Michael. And that speed also means your cash flow is managed though the speed at which you deliver in projects? So if you can deliver lots of small increments quickly, your cash flow as an SME is much for stable? Andreas. Yes, you improve the cash flow. And you improve the clients because they don't have to create big budget chunks. The other thing is that we might want to give the products for free, where we keep ownership of the products and we sell as service.					

Thematic analysis of Theory Question 2:

	Define risk	Supply side risk							Global risks			Demand side risks				
		Quality	Time/speed	Financial	Legal	Loss of control of IP		Supply side financial	Regulatory, legal and compliance	Financial and Currency	Country based PEST	Quality	Time/speed	Financial	Forcasting demand	Demand side financial risk
	ultimately it is the failure to deliver what you promised to the customer and the failure to deliver that value proposition	It may be qualityit may be time based it may be time based based it may be financial damn for me the biggest one is time, the more you can get out in the least amount of time possible the less your overhead is based Why financial is less important compared to speed				so that again would turn to the relationship so yes we do not send out stuff to certain manufacturers because of that so that is a valid consideration									So you give him an order and maybe fore cast as to what you plan on taking off the next month	
You unearth those inherent risks when you do a pilot. Some risks are inherent to a project and you only discover them as you go along.	There is a financial risk and then there is an engineering/technical risk. for me I always look at the sustainability of something. I really look at what is the risk in terms of sustainability and growth	the question is how do we fix it then the cost implications as long as we've handed over a clear manufacturing spec if that is at our fault, its our risk.		ultimately that value proposition is worth more then any profit you'll make on the Top because you'll make it up in future jobs. Cost is subordinate to speed and quality	If it lies in that Gray area which it often does that's where the relationship is very important because between you and the supply you need to work it out and you need to work it out quickly and not get caught up in big corporate arguments about it because there's no time because ultimately that value proposition is worth more then any profit you'll make on the Top because you'll make it up in future jobs Relationships over legal protection.	If you don't trust someone and you don't think your IP is safe with him well then they don't make the list (viz. of potential suppliers) irrespective of the price						how far ahead do you forecast? Warren. About a month. That's about what we can do at the moment. What we sell usually goes out in the same month of purchase. It's only the newer IP that are going to incur a larger lead times and a bit more complex approach.	
buying power thing, if you look at the buying power of a small to medium enterprise, generally speaking you are back of the queue when you need assistance	technical, you cant have a failure with your products in the field. That is a very high risk that you need to control Quality of products is critical	2 biggest are meeting the spec and then the time commitments then outside of that the cost you know up front		of course it does. We are buying a product and we have got to add value to it and then we're going to sell it on. So the price that we buy it at as a major affect.		ChuckFication. we actually do that with the Chinese where we only give certain parts of certain projects to different suppliers so that nobody has the whole project										
People don't consider Tier 2 or tier 3 of the supply chain, they only consider the first person. I think that our risk has been the damage in the customer base cause our suppliers have dropped us.	I'm not sure maybe part of it is that if your manufacturer isn't able to deliver in the required	and in the ideal world the quality is more important but we're not particularly good at planning as S Africans. Need to balance quality and speed. Risk vs performance as a TO3 rm strategy.		sometimes you need to sacrificed price so that you get the right quality. It's not always about price and price is key but it's not always about price .		Did I discuss this with Company B?										
Biggest risk is cashflow	time. Sure everyone should have an open channel of communication and say to you I cannot deliver because I have something that has happened on my supplier couldn't supply me for some reason,	and that makes a world difference (mike. The relationship) because it allows for rapid turnaround time which then reduces up overhead time on a project which then means that at the end of the day even though the individual aspect of the project may cost a little more the ability to get these projects out with less overheads means you are still sitting in a good position from a profitability perspective				Company C has this problem so they practice chunckification										
		failures in the field means a loss of your margins as well as the potential loss of your margins on other projects to rectify the issue. Why Quality is important and how it ties up to financial.	For some of our products, willie, our technologist, was there permanently. From morning to night because the initial paper work was, the inputs initially wasn't adequate enough and the timelines where just too short.	. Cash flow is one of the biggest issues is an Sme. If you ain't got no money to buy stuff you ain't got anything to sell		intellectual property and proprietary designs: yes, we only in source. Maybe we would outsource would be dumbed down versions of that IP										
	value of the purchasing. this value is a percentage of my product or operations so I can value risk by juxtaposing these 2. To get it wrong, the high-risk band, for instance I value losses. One can look and say it's	it's quality in terms on the design but also in terms of the manufacturing This is their biggest risk		not everybody can buy COD . If you've got an account you can get the product in sooner rather than later, and that will help with the cash flow		loss of control of your IP? Is that something you guys see as a risk? Warren, no, we don't see a risk there. Inherently, our IP is capability driven. I won't say that is the reason we don't see a risk. I think our IP is never outsourced in its entirety, so one cannot see a connection between outsourcing a part and someone realizing what we are doing and benefiting from it.										
	independent of value and it's more to do with scope of	The biggest risk would be communication. So giving poor designs and not being able to, through an open channel, discuss on a regular basis, the interfaces. Sometimes there are changes, so the communication is the biggest component of risk that you have to manage														
	supply, limited scope of supply. Value is irrelevant, I need to get the quality period, or I need to get the certain skill set and it's simply not available. The risk of not having a solution is failure. So, it's almost binary in that context. I would say that that, I view risk in both worlds	. And at the end of the day the product goes off to the field you need to know and trust that what you have sent out will do the job that you have manufactured for. If the guys manufactured it substandard, you can start getting comebacks. And that costs money and reputation damage	I'm not sure maybe part of it is that if your manufacturer isn't able to deliver in the required time. Delivery schedule risks	And it's (viz insourcing as opposed to outsourcing) prevented us from seeing Cash bleed out into the market and not necessarily retained here for better use. My staff, in general, are keen for the training. So our guys are multi skilled,												
	He views risk as both financial and quality	And that costs money and reputation damage . Why quality is important	If there is a problem how do we resolve it. Timeously. and that goes back to our suppliers.													
		sometimes you need to sacrificed price so that you get the right quality. It's not always about price and price is key but it's not always about price .														
		Yes we have. But it's not a major thing. Yes we have but because of that relationship we have built with our suppliers it's very quickly and amicably resolved														
		delivery and quality ... rather if our supply leads us down we end up leading our customers down. And there is a problem Lee. So it's supply and quality.														
		you were present now with the guy I've never met, who is now supplying us with something for a very high in product, which a customer is still phoning me about, in the middle of this interview. So there is high high pressure, there is the supply who had screwed up, this week	I must be honest with you; I think what we struggled the most with is with suppliers who don't bring the parts. Michael. is that a delivery schedule? Warren. it's a delivery schedule thing and understanding us thing													
		Yes absolutely. sizes don't fit on occasion, for obvious reasons.	expected lead times have been pushed out													
			what we see is that if we don't dovetail our procurement decisions with our expected delivery time frame, in other words, if you are buying something with and expected payment terms of a 30 day account, and you don't deliver within that time period, you find that your incoming cash and your outgoing supplier cash don't match and you are left with the difference													
				from a cashflow management point of view, I would say that outsourcing anything has a massive impact on cash flow and obviously the selection of suppliers, the ratifying of those suppliers, having them on an account as opposed to a COD basis is quite important. Very.												

Thematic analysis of Theory Question 3:

Not classified	Realtionships		Risk Avoidance			Risk control		Monitoring and coaching		Risk assumptions				Risk Transfer		Why	Formalised ERM structure	What extent does background shape how you deal with risk	Would this homework be of use
			Method Classification. This is the same as risk vs. performance	Risk vs. performance trade-off	Horizontal channel/Vision	Quality control	Prototyping, reviews and testing			High inventory levels	JIT inventory	Budget and schedule reviews	Insurance	2nd party warranties				
You have to have relationships with your suppliers you don't supply you even if you pay a premium price if we have got a backup. You have always got to have a backup	right relationships you can them build it at a lower cost. Relationships fully courage stock		Company A.also quite about this	Company A spoke about this		relationships. are how things get done the better your relationship is with your manufacturers better service and better outputs you'll get in someone who. doesn't.	for a prototype we will manufacture		you need to pick it up early so you can manage it	So, we have very specific arrangements in place regarding how the suppliers maintains its stock levels. We've actually gone to the level where, as his ERP system, we have line of sight as to how he manages his stock	So what we normally do is we carry stock and then get it in quick in order for the next month or 2. So you give him an order and maybe he'e can.t as to what you have an idea of the next month or	With Company A and B , by default, because IT is what delivery schedule would not be such an issue	If it lies in that Gray area which it often does that's where the relationship is very important because between you and the supply you need to work it out and you need to work it out quickly and not get caught up in big corporate arguments about it because there's, no time because ultimately that value proposition is worth more than any profit you'll make so the Top because you'll make it up in future jobs Relationships over legal protection. Why like, doesn't work for us. ERM		The sooner the client knows the situation the better and if that is going to impact on the ability to get into the deadline you don't want there to find out the day before Manage client/deal/risk through early identification and communication of about.		Company A has no formalised risk management structure		There is definitely a need for the knowledge and an awareness of the risks involved and how to avoid them but to build the frame work. . . you could build a guide line
We then proceeded to go with the first supplier and some products were due to leave the previous day and were not completed. Warren proceeded to organise his staff into a result ad hoc production line. This resulted in the employee's working in multiple station on specific tasks in a semi-automated dash manual process. . I believe that the goods left shortly afterwards, after his intervention.	relationships are how things get done the better your relationship is with your manufacturers better service and better outputs you'll get in someone who doesn't		We have chosen to go on both the same manufacturer and a second company where we have a very good relationship and with small companies they can't afford to hold massive stocks of raw material. The same with us. This is why the supply chain works very well.	solver we haven't had a problem with anything to do. We gave one supplier the contact another supplier the intercom, another supplier the internet.	As an SME, you have no choice but. And that's why if you have a choice, you have no choice but. Evolution. Break up the bigger, complicated systems into smaller systems and have an evolution not not												well, a lot of it I see as experience. The question is, if you are new to this space and you don't have that experience, you haven't had your fingers burnt a couple of times and (Michael. You need to. simple, your knowledge up quickly)
	so if you are able to build up these relationships and have part of that work and you have guys who will do you believe will deliver against the spec you put in place is the best way to ensure success is to have them you can see your limited resources is being to additional revenues. Use of methodology to manage spend to market and quality. Also links to monitoring and reporting. All these guys do IT manufacturing which is in the electronics		so the mechanical side will stay started with the son's family . it, knitting, in excess of 30 years. Unless with the electronics. The electronics is 12 years.	intellectual property and properties . . . we only in centre. Maybe we would outsource would be dumbed down versions of that it	defined in terms of server do without it or if we do Without it, and This step is not managed and		it is wolfin an acceptable spec or not? If not, it has to be rectified. If it is not perfect but within an acceptable spec then less so (ya . may not need to spend as much time on it. Traditional spec, so . a blemish here or there . . . so be it. It is something you would still want to rectify but not something that would require you to redo work you put out previously	Michael. The main way that you go mitigate the risks is through upfront specifications and upfront designs/engineering work? And provided that's done, then the likelihood of issues in the current standard then that mitigates manufacturing or production risks? Andrew. Yes. It leads to a smaller pool of risks. Other risks require you to do piloting and prototyping		That is core for us to manage. from supply chain POV. the product. non-core		One would ideally like to carry stock but you cannot carry too much stock. Why? Cash flow issues? The because you're tying up your money. So you've got to try and find a balance between having enough stock and maybe trying to smother the stock						
	JIT is ties in that Gray area which it often does that's where the relationship is very important because between you and the supply you need to work it out and you need to work it out quickly and not get caught up in big corporate arguments about it because there's, no time because. ultimately that value proposition is worth more than any profit you'll make so the Top because you'll make it up in future jobs. Relationships over legal protection.		It's very difficult to deal with the guy if you haven't got that relationship. The people know what your requirements and criteria are, the standards that you have to meet and I think that the relationship the people tend to. to take chances. Because there's a good amount of trust between the parties.	Maximo, no, we don't see a risk there. Inherently, our IP is capability driven. I won't say that is the reason why we've been with Weld-ex. IP is never outsourced so its entirely, so one cannot see a connection between manufacturing a part and someone welding what we are doing and benefiting from it.			we would still try put something in place to improve the quality control through the manufacturing proces	Michael. The main way that you go mitigate the risks is through upfront specifications and upfront designs/engineering work? And provided that's done, then the likelihood of issues in the current standard then that mitigates manufacturing or production risks? Andrew. Yes. It leads to a smaller pool of risks. Other risks require you to do piloting and prototyping		understand or shouldn't keep on buy of it, you don't have regular, sizeable processes where you come in and visit at certain stages of the manufacturing process. Communication		So, we have very specific arrangements in place regarding how the suppliers maintains its stock levels. We've actually gone to the level where, as his ERP system, we have line of sight as to how he manages his stock						
	very jad up the pressure on the suppliers and you dictate what the time is and you tell them that you can't go outside of the time. That's how we make sure we deliver to acceptable standards within the given time. You are able to do this through a strong relationship. All IT Solutions control		Manage delivery schedule risks through Sure everyone should have an open channel of communication and say to you I cannot deliver because I have something that has happened on my supplier couldn't supply me for some reasons.			detail serious interaction with the manufacturing partner Through which specifications	If your drawings are correct and you lend the product through your pilot, risk is mitigated	So even though they are taking on the manufacturing you need to be there		we are looking at the customer demand and understanding from a demand point of view what must we manufacture						
	we can't afford to cover huge overheads for long periods of time in order to win a contract like that so our game is to have a lean structure because we don't carry extra/ our salaries are in the African market. Same values for the control of overheads		Relationships are often help ensure that you've got a quicker service capabilities and a quicker time to market time			Overall the end of the day the product goes off to the field you need to know and trust that what you have sent out will do the job that you have manufactured for. If the guys manufacturing are not aware, you can have getting overblocks. And that costs money and reputation damage	Overall the end of the day the product goes off to the field you need to know and trust that what you have sent out will do the job that you have manufactured for. If the guys manufacturing are not aware, you can have getting overblocks. And that costs money and reputation damage	problems with the delivery schedule form the manufacturer? Andrew. You can if you are not part of the loop but the way we manage that is we have a weekly meeting between the manufacturing and them parties. I have no hoping to say on the delivery schedule										
	yes there is a spec that needs to be met but the ability to get that speak out quickly and have a fast turn around time and have the relationship in place (with manufacturers) where you can do that is critical but often our work is done by often precluding it otherwise we would sit in the same queue as everyone else		generally speaking, can't command the degree of focus that an SME requires in order to be agile in the market. Because those two things don't tackle. Agility and time to market are important			you also need to build in a strong quality assurance for every product that comes in whether it is a finished product or a component that it conforms to our specifications , and if it is raw materials we come back as natural simply cut in such a way that there is a check at each step. On conformity. So we have quality and conformity right through to the final item. We by extension do not field problems before it gets to the field	Knowledge and experience that myself, my team and others have to it, our competitors in the same space cannot leverage that.		they allow us to work in their factory. In china.								
	I wouldn't say the process is part of the relationship but the relationship is established before and you work together that strengthens the relationship and the confidence you do have and how you work together		Businesses don't compete, supply chains do			We would rather i think in and get involved and resolve the problem with the supplier because that strengthens the relationship. Previous we have that relationship			In general you follow a similar recipe. You open up wholesale groups, steps of manufacturing, is actually doing a frame together. Just looking at Vendors/programs input								
	was very selective. Just like friendships that you have, it's very similar in business, you need to develop and build that friendship. And you build that trust and faith, it's very important		how long have you been doing business with him? Warren. Some of these companies are very, other companies as close as 3 months period			Allow us to create obviously if they have the stuff that they tried to conduct as well as wherever possible try to get involved when there is a problem. So we can see where we can improve . If we have had a failure, or we can do. Or say we have like, we think that is doing something.			I will always be available to open, multiple communication channels. So to send a person on site is part of the process, depending on what product is being supplied and what the process is. If there is Amended that item, you pull all that								
	you can build relationships based on friendship and trust you cant build faith and trust in a document. A document will basically highlight what was already discussed and believed in. I can that a mitigate those risks. A solid relationship and what I speak is what I preach. I don't change my word		you connect best suit knowing the you who supplies you.			we don't just look at quality and just hope it is there in the end, it more like, when we manage it, we manage it with very simplistic reviewing processes and very simplest check lists			are an informal person but I need everything to be documented								
	If you're not friends, because friends muddies is the water, but if you have a solid relationship built on trust i'm leaving on you.Buzzword I need you to help me. Inherently, supplies in say I'm in a position of trust now for me for trustworthy methods, will treat you halfway		as the opportunity for me to even then is there but the opportunity to invest him and convert them into Trust capable supplier			outsourced components being so simple, generally, also fit for purpose, generally, Simple checks at the extreme. delivery, should prevent that from contaminating the shop down the line			In manufacturing processes, you have your design pack and the manufacturing process takes. that from stage to stage. So you have to define the critical path elements, what are the tactile necks? What things can be done? What has to be done in series vs. parallel. Monitoring and coaching as well as Risk Product management provides								
										And early notification of the problem. would be based on what you relationship								
						specific products. Items that relate to all products and have a common use. Like a fastener, a bolt, a connector, a ventilation system. where we will use samples, inspect data sheets, go through things very technically, have training and if , at that point, even after having received training from certain suppliers, on the use of these products, we can still reject because we need to know if we are going to go the support . so then we dealing with a known part			supplier you have got to school him as to what your requirements are you can give him the specifications but at the end of the that's what I want but you actually need to tell the guy when I'm saying this , where I picked the order doesn't mean I want it on the 29/3rd's as estimate we need to be flexible. We don't want late . don't supply me the order on the 25th because what I want is on the 30th I can't use it on the 25th because I have a number of other stuff before I have to pay you so it'll all be with cash flow								