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Strategic supplier selection criteria during supplier selection process in sourcing

A Minor Dissertation Submitted in Partial Fulfilment of the Degree of

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In

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FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

of the

UNIVERSITY of JOHANNESBURG

by

TUMELO LESISA

2018

SUPERVISOR: Prof A Marnewick
DECLARATION

I Tumelo Lesisa, hereby declare that this document represents my own original work and that it has not been submitted for any degree, qualification or credit at another institution.

I further declare that all information and data from other publications, books, and resources are properly referenced according to the IEEE standard referencing technique.

__________________________   _______________________
T. LESISA            DATE
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ABSTRACT

The rail industry has become important in executing government’s projects to improve South African transportation system. Rail industry is showing to have potential of becoming an alternative transport system, into which the South African government is investing money. This has led to the project that a company in rail industry is currently undertaking to manufacture new commuter trains for the South African community. The project requires a development of supplier base which includes South African suppliers when executing this project of manufacturing newly improved trains in South Africa.

Regardless of how exciting this project is, a company in rail industry is faced with a challenge of searching for suppliers that are able to help it to achieve its objective. This can be achieved through a proper supplier selection process that is consistently assessing supplier risks prior to selecting them. A robust selection process must be in place with established selection criteria to assess areas in which risks could arise from. The selection criteria can assist in identifying risks in the early stages of the supplier selection process.

This research studies supplier risk assessment implemented by a company in rail industry to identify supplier selection criteria. A literature review was completed to identify supplier selection criteria that should be considered during the supplier selection process and matched with criteria implemented by a company in rail industry. The research further studies risk management frameworks which would provide structure to the risk management process of a company. The frameworks that are considered in this research are: ISO 31000:2009 framework, COSO: 2004 framework, AS/NZ 2004 framework, SCRM framework as well as PMBOK framework.

By utilizing pattern matching technique, gaps are identified between the supplier selection criteria implemented by a company and literature reviewed. Further the research proposed a theoretical supplier onboarding model which incorporates risk assessment activities within the supplier selection process focusing on all identified selection criteria. This would reduce chances of having inconsistencies during supplier risk assessments process.
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LIST OF ABBREVIATIONS

AS/NZ – Australian and New Zealand framework
CFO – Chief Financial Officer
COSO – Committee of Sponsoring Organisations of the tread-way Commission
CRO – Chief Risk Officer
ERM – Enterprise Risk Management
IRIS – International Railway Industry Standard
ISO – International Organisation for Standardisation
PDCA – Plan, Do, Check and Act,
PMBOK – Project Management Book of Knowledge
PrSM – Project Sourcing Manager
QCDT – Quality, Cost, Delivery and Technical aspects
RFQ – Request for Quotation
SCOR – Supply Chain Operations Reference
SCRM – Supply Chain Risk Management
SDL – Supplier Development Leader
SPQD – Supplier Product Quality Development Manager
SQD – Supplier Quality Development Manager
SRM – Supplier Relationship Management
CHAPTER 1: Introduction

1.1 Background

This research is based on a train manufacturing company with many years of experience and a well-established record in successfully producing commuter trains for the European market. The company has formed a consortium with two South African shareholders in order to renew the current fleet of commuter trains in South Africa. This European company is the majority shareholder of the local consortium here referred to as firm Y for confidential reasons. The research is conducted on the consortium company, since it is the one that is executing the project of building new trains for the South African market.

The launching of firm Y was in 2014, and the manufacturing of trains is planned to commence locally in South Africa in 2018. This project is divided into two phases, of which phase one is to build twenty trains in Brazil while the remaining balance of the trains will be built in South Africa. The first portion of the trains since the launching of firm Y was produced in Brazil since 2014 until the end of 2017 while a local manufacturing plant is being set up for preparation to start building trains in South Africa.

In order for the firm to achieve this huge milestone, it has to do this through sourcing from local suppliers. This means that firm Y must ensure that they have a robust supplier selection process that will form part of this milestone without having issues with assembly disturbances. It is a fact that for firm Y to successfully execute its project, suppliers play a vital role in its supply chain. In this case firm Y is required to ensure that its supplier’s activities within its supply chain are managed well and are sustainable [1].

It is also a fact to firm Y, that a poor supplier selection poses a risk of not achieving its main goals of on time deliveries, good quality from those suppliers, and at a reasonable cost. Many firms strive to ensure that their suppliers or sub-suppliers are sustainable and compliant with its corporate sustainability standards [1]. This will assist in managing risks that are faced by firms through suppliers and sub-suppliers.
1.2. Problem Definition
In this day and age companies are not operating in isolation, which means they are interdependent on each other as suppliers and customers [2]. This is also true with firm Y used here as a case study; the firm has suppliers that are onboarded into the supplier base which are integrated into the firm Y’s supply chain. This means the selection of suppliers plays a key role in the success of firm Y, risk assessment, as well as the management of those risks associated with suppliers also becomes crucial for firm Y when executing a strategic sourcing plan.
Currently firm Y performs an assessment on suppliers prior to onboarding them; however it finds itself selecting suppliers that turn out to not have been properly assessed through risk assessment. These suppliers end up not being able to deliver as per firm Y’s requirements. This exposes firm Y to end up with suppliers that are posing risk to firm Y’s supply chain, yet they have been assessed through the current risk assessment process.

*If a risk assessment approach is not structured and consistently applied it can lead to gaps in the supplier selection process where selection criteria are not properly assessed.*

1.3. Research Questions
Supplier risk assessment is about managing threats that could have an adverse impact on the operations of an organisation buying from the supplier. Senior management together with a middle management team usually focus their attention to those threats. Their focus is mainly on threats such as financial threats, market penetration, product or quality risks [4]. Based on the problem defined earlier, two key research questions were defined to be answered by this research in order to ensure that the problem is addressed.

**RQ1**: What are the strategic supplier selection criteria that a firm should consider during the supplier selection process?

**RQ2**: How should risk assessment be performed on these supplier selection criteria?
1.4. Research Objective
This research focuses on assessing and studying how firm Y is implementing the supplier risk management process within its sourcing department. The research further identifies gaps on the current risk management strategy, and how it can be used to identify potential suppliers that are risky prior to onboarding them into the supplier base.

The main objective of this research is to understand the current risk assessment implemented by firm Y during supplier selection; this is to identify areas that could be contributing to the current problem of selecting risky suppliers.

1.5. Research Design
In this section details of what will be done to provide answers to the research questions is discussed. The questions developed for both interviews and questionnaires are derived based on literature review. We then discuss the data collection plan and how to measure and analyse it.

1.5.1 Nature of Research
According to [5], descriptive research is carried out to describe existing phenomena, and it describes a subject using observations. This type of research can be either qualitative or quantitative in nature. A case study is built in this research in order to try and find out how to improve the supplier selection process through the use of risk assessment within firm Y.

1.5.2 Data Collection and Analysis Plan
Due to the fact that this research is a case study questionnaire, interviews and document analysis are used to gather data for this research.

Questionnaires, interviews and document analysis are used within firm Y’s sourcing department and its support functions in order to understand the current supplier selection process and supplier risk assessment during the selection process. Data are planned to be collected from different levels within the sourcing department and supporting departments which are outlined in chapter 3 in the research methodology.
1.5.3 Measurements
This research is based on a case study that is done with a train manufacturing company. The case study is a single case study design, and it is not an embedded analysis. This means analysis will be done within sourcing to understand how the current supplier assessment process is performed [5]. The unit of measure will be process based, which will be assessing the risks management process of suppliers through a supplier selection process.

1.6. Delimitations
There are various types of risks that can be of concern in manufacturing and in the supply chain of firm Y. For the purpose of this research only risks related to the supplier side will be explored and analysed as per Figure 1. The diagram in Figure 1 shows the upstream supply chain, where a purchasing department from firm Y buys from tier 1 suppliers known as direct suppliers. These direct suppliers also have their own suppliers, which are considered to be tier 2 suppliers to firm Y, known as sub-suppliers. The focus of this research is on the management of tier 1 suppliers, although the following risks are excluded from this research:

- Internal risk management associated with health and safety, and facility readiness of firm Y.
- External risks such as environmental issues, logistics risks.

Figure 1: Upstream Supply Chain (Sourced: Authors construct)
1.7. Structure

Chapter 1: Introduction

Research background and problem definition are outlined, research questions as well as the research objective and research design are also discussed.

Chapter 2: Literature Review

Literature review is developed where supplier selection criteria are considered when assessing suppliers are discussed. Risk management frameworks, as well as the link between risk management and supplier management key indicators are outlined.

Chapter 3: Research Methodology

A case study methodology is selected, and a questionnaire is developed in this chapter. A detailed case study design and data collection procedure is also described in this chapter.

Chapter 4: Analysis & Results

The analysis of the case study and data collection is done in detail in this chapter in order to answer the research questions for this study.

Case study results that are derived from the analysis are detailed and discussed in this chapter.

Chapter 5: Recommendations & Conclusion

Research conclusion and recommendation of the study are discussed in this chapter.

1.8. Chapter Conclusion

The objective of this chapter was to describe and establish the research problem as well as the research questions. We also define and outline the research objective and research design for this research. In this chapter we furthermore discussed the limitations of the research as well as the structure that will be followed in executing this research.
2.1 Supplier Selection
Currently globalisation of sourcing has become common in many organisations in order to benefit from a broad supplier base while increasing its competitive advantage [6]. This has now opened up a buying company to the risk associated with the performance of suppliers. It is for this reason that suppliers play a very important role towards the business success of the buying company, since they have a direct contribution to its product quality, flexibility and costs [6].

Supplier selection becomes important in the buying company, since it aims at increasing the chances of selecting good suppliers over bad suppliers. A strong supplier selection process is dependent on adequate selection criteria that are defined and determined to evaluate suppliers before they are selected by a buying company uses [6, 7]. In the next section, we further discuss the details of the key elements of supplier selection in order to reduce the chances of selecting risky suppliers.

2.1.1 Supplier Selection Criteria
A supplier selection criterion is essential in developing a long term relationship between suppliers and a buying company. This will afford suppliers and the buying company stability in product quality and reliability through an improved supply chain [7]. This is necessary since not all suppliers identified are suitable to buying companies, as the requirements are different from one buying company to the next [6]. Therefore it is important that buying companies have their own supplier evaluation criteria based on their requirements [7].

Supplier selection must ensure that suppliers evaluated are complying with the requirements of the buying company, and this can be achieved through conducting audits at the suppliers and assessing supplier sites, processes and identification of any non-compliance with the requirements [1].

Table 1 shows the criteria used by various buying firms when selecting suppliers to form part of their supply chain. In this table it is evident that supplier selection principles have common key criteria or areas that are basic requirements in selecting and allocating suppliers.
These common areas are product quality, cost/price, and delivery on time. According to [8, 9, 6, 10] in an attempt to building a long term supplier base, a buying company cannot afford to just look at only the three mentioned criteria. It is therefore important to include other aspects such as environmental factors, social factors, economics and other factors cited in Table 1.

These criteria are considered by most buying companies when onboarding suppliers into their supplier base.

Table 1: Comparison of supplier selection criteria by various articles

<table>
<thead>
<tr>
<th>Source</th>
<th>Year</th>
<th>Selection Criteria</th>
</tr>
</thead>
</table>
| [1]    | 2014 | • Certification with international standards  
|        |      | • Auditing suppliers for further assessment  
|        |      | • Sub-Supplier Management |
| [9]    | 2016 | • Short-Term:  
|        |      |   o Price, Quality, Delivery  
|        |      | • Long-Term:  
|        |      |   o Quality philosophy  
|        |      |   o Financial Capability  
|        |      |   o Technological Capability  
|        |      |   o Reputation  
|        |      |   o Existence of standards  
|        |      |   o Performance History  
|        |      |   o Profitability  
|        |      |   o Labour issues  
|        |      |   o Production Facility & capacity  
|        |      | • Environmental Factors  
|        |      | • Potential for partnership  
| [6]    | 2013 | • Product Quality  
|        |      | • Cost of Production  
|        |      | • Delivery Performance  
|        |      | • Political Stability  
|        |      | • Transport Connection  
|        |      | • Corporate Equipment  
|        |      | • Ecological & Social Aspects  
| [7]    | 2015 | • Flexibility with Meeting Fluctuating demand  
|        |      | • Delivery Lead time  
|        |      | • Pricing  
|        |      | • Quality  
|        |      | • Demand due time  

pg. 7
<table>
<thead>
<tr>
<th>Year</th>
<th>Criteria</th>
</tr>
</thead>
</table>
| 2016 | - Price  
      | - Quality |
| 2015 | - Economics:  
      |   - Cost,  
      |   - Speed,  
      |   - Flexibility  
      |   - Quality  
      | - Quality Relationship:  
      |   - Trust,  
      |   - Effectiveness of Communication  
      | - Environmental:  
      |   - Material, Energy, Water, Biodiversity, Emissions, Waste Management,  
      |   - Supplier environmental  
      |   - Selection procedure,  
      | - Social:  
      |   - Labour practice, Society,  
      |   - Human rights,  
      |   - Product responsibility  
      | - Global Risk:  
      |   - Currency risk,  
      |   - Disruption risk through political stability and terrorism  
      |   - Cultural compatibility,  
      | - Sustainability, |
| 2017 | - Commercial Criterion:  
      |   - Quality  
      |   - Price  
      |   - Quantity  
      |   - Delivery time  
      | - Supply Chain Risk:  
      |   - Technology risk  
      |   - Information risk  
      |   - Management,  
      |   - Economic  
      |   - Environmental risk,  
      |   - Societal risk,  
      |   - Ethical risk |
2.1.2 Supplier Selection Deductions
Suppliers play an important role in the success of businesses, which makes supplier selection an important topic for the buying firms [6].

2.1.2.1 Supplier Selection
In Table 1 we discussed and compared the selection criteria that are considered by various researchers. Based on these criteria, a list of supplier selection criteria is deduced in order to answer the following research question “What are the strategic supplier selection criteria that a firm should consider during the supplier selection process?”

It is noticeable that international certification of standards is important to be considered in the selection process as mentioned by two authors [1, 9]. The other supplier selection criteria that are cited by all researched articles are: quality, cost and delivery. Most organisations are increasingly investing in sub-supplier management, which is one of the criteria that they look for when onboarding suppliers, to ensure that suppliers are able to manage their own suppliers [1]. Another key supplier selection criterion being cited is the supplier’s financial stability [9]. Labour practice is also an essential supplier selection criterion, to ensure that suppliers respect labour relations [9, 8]. The ability of suppliers to be flexible to demand variation is important to be considered by the buying company [7, 8].

Many buying companies prefer to work with suppliers that consider environmental compliancy in their day to day operations [9, 8, 10]. It is also shown that technological stability is of importance in supplier selection criteria [9, 10]. In the dimensions of supplier evaluations discussed by [9], it is found that production facility/capacity is a key element in supplier selection. During supplier evaluation the buying firm should consider challenges such as political stability of that country when considering buying from abroad as it is regarded as a global risk in procurement, while it is also important that suppliers can show that they are sustainable in order to instil confidence in the buying firms that the relationship will last longer [6, 8].
In some companies there is a short-term model of evaluating suppliers, which enables the buying firms to consider a supplier’s reputation as a key selection criterion, since it assures the buying firm that they can build a better relationship that will yield good quality [9, 8]. It is considered a prerequisite that suppliers have a strong management team with effective methods in order to ensure smooth supply and demand [10].

A list of supplier selection criteria is deduced below as shown in Table 2.

Table 2: Supplier selection criteria deduction

<table>
<thead>
<tr>
<th>Supplier Selection Criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>International certification</td>
<td>A certification of organisation that proves that companies fulfill social or environmental requirements. Usually the requirements are standards that they comply with, such as ISO 9001.</td>
</tr>
<tr>
<td>Quality</td>
<td>Meeting the requirements of the customer according to what was stated in the purchasing specifications.</td>
</tr>
<tr>
<td>Cost or Pricing</td>
<td>A buying firm works with the budget and the cost or pricing of the supplier must be within the budget.</td>
</tr>
<tr>
<td>Delivery</td>
<td>Supplier’s ability to deliver its service or products on time in full as per the agreed schedule with the buying firm.</td>
</tr>
<tr>
<td>Sub-supplier management</td>
<td>Management of suppliers beyond tier 1 suppliers.</td>
</tr>
<tr>
<td>Supplier’s financial stability</td>
<td>When the supplier is able to pay its short-term debts, and is able to stay open in the next 12 months without being considered insolvent.</td>
</tr>
<tr>
<td>Labour practice</td>
<td>In this context, labour practice refers to the consideration of workers’ rights, and exercising the basic conditions of the employment act (BCEA).</td>
</tr>
<tr>
<td>Flexibility to demand changes</td>
<td>Being able to satisfy the buying firm’s requirements in times of fluctuating demands.</td>
</tr>
<tr>
<td>Environmental compliancy</td>
<td>Green design, pollution prevention, green image, green capability, environmental systems.</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Technological stability</td>
<td>This refers to the technological capability of the suppliers.</td>
</tr>
<tr>
<td>Production facility &amp; capacity</td>
<td>The facility in which production will take place, and its ability to meet the buyer's demands per demand period.</td>
</tr>
<tr>
<td>Political stability</td>
<td>In order to reduce delivery disruptions, the company from which the buying company is buying, should be situated in a country which is politically stable.</td>
</tr>
<tr>
<td>Sustainability</td>
<td>How sustainable the supplier is in the business, looking into working conditions, wages, and its suppliers. It includes multi-criteria, some of which are covered.</td>
</tr>
<tr>
<td>Supplier’s reputation</td>
<td>Reputation for integrity, having customers that are happy with supply from a specific supplier.</td>
</tr>
<tr>
<td>Supplier’s management team</td>
<td>A strong management team to implement efficient management methods that are essential in the development of a supplier.</td>
</tr>
</tbody>
</table>

Buying companies are striving to become competitive, which means they must ensure that they have a structured supplier network which will allow them to compete in the market space [13]. Once the supplier has been selected, sometimes buying firms enter into a supplier development program which aims at improving supplier performance [14]. However, supplier development and supplier performance are not the focus of this research.

A deduction of the supplier selection criteria is completed; in the next section a discussion about the risk management process which considers risk management frameworks implemented by other industries will be discussed.
2.2 Supplier Management

There are challenges that companies face in trying to achieve competitive advantage through supplier management. These challenges vary from business challenges such as international competition to catastrophic challenges such as terrorism and environmental challenges which can have an impact on the entire supply chain of the manufacturing company [15]. Supplier development and supplier performance become important to address these challenges should they arise.

2.2.1 Supplier Development

Supplier development is another important aspect for the buying firm, since it has a direct impact on their overall performance [15]. Supplier development activities vary from company to company; some companies include activities such as technical support, direct investment and supplier plant visit to assist with operations at the supplier [15]. Supplier development is defined as “any effort by a buying firm to improve a supplier’s performance and/or capabilities to meet the manufacturing firm’s short- and/or long-term supply needs” [13]. This exercise can be beneficial; however it can also be costly to both the supplier and a buying firm.

2.2.2 Supplier Performance Management

It is vital that sourcing understands supplier performance capability in order to select or make a purchasing decision. Buyers are required to understand the management of suppliers, quality issues, and delivery performance [16].

In order to proactively identify and predict supplier performance, it is important that suppliers’ resources and capabilities are known and they can be compared to best practices in order to improve their performance [16]. The order category of supplier performance is on time delivery performance, which is the factor of supplier performance output. Today supplier relationship is becoming a topic that many organisations give attention to in order to find ways to improve their supplier performance, and in return improve their overall performance [12]

It is crucial that improvements should enhance a supplier’s performance since they have a direct impact on a buying firm’s performances.

The risk management process will now be discussed to provide an understanding of supplier selection, supplier management and risk management.
2.3 Risk Management Process

2.3.1 What is Risk Management?
Global procurement has become so popular in many organisations; this means organisations are becoming prone to risk arising from procurement. This means that organisations that are procuring its raw material or components from suppliers must have a clear visibility of risks associated with its suppliers. The economic efficiency of any industry is impacted by the counterfeit actions that are taken [3].

Risk management is the main component of any organisational strategic management to ensure efficient management of operations and to predict possible adverse effects that can be caused [3]. Therefore organisations find themselves having to adapt to implementing a formal risk management process for each type of risk identified. Literature shows that there are two types of risks factors that are common in many organisations’ internal and external risks factors [3]. The attributes to these risks are: intellectual property (IP) risks, financial risks, strategic risks and operational risks as well as hazard risks.

It cannot be argued that there is a need in every organisation to have a proper risk management structure in order to protect its supply chain from disruptions and threats; this could afford firms competitive advantage [15]. According to [16] supply chain risk management has become important for firms, especially since global sourcing is becoming more and more prevalent.

A risk management process is important to be established for organisations to use as a framework. The framework must be able to cover four basic risk responses; 1) risk avoidance, 2) risk transfer or pool, 3) risk acceptance and 4) risk mitigation [17]. The framework should have a clear process of risk identification; it must be able to channel an organisation to assess risks. It must lead to solidification of existing solutions and domination of the administrative approach [4].
In this section we will discuss frameworks that are found in literature and compare them in order to decide which can be adopted for this research. There are several frameworks that are used by various organisations which provide the key elements of enterprise risk management. The following are the précised frameworks from literature: the Committee of Sponsoring Organisations of the Treadway Commission (COSO) published enterprise risk management (ERM) in 2004 (COSO, 2004; COSO, 2010), the international standard ISO 31000 was developed in 2009, the AS/NZS4360 risk management model proposed by New Zealand and Australia (HM Treasury, 2004), risk management model developed by HM Treasury in the UK as well as the Supply chain risk management (SCRM) framework developed to address supplier risk management [2, 18, 19]. There is also a project management book of knowledge (PMBOK) framework which is found to be popular in the South African engineering and construction environment [20].

These frameworks are popularly known as enterprise risk management (ERM) which aims at integrating risk management processes within organisations [19, 21, 22, 23, 24]. ERM is a process in which executives, managers and personnel are organised in a manner in which they are able to identify and manage events that are posing risks to an organisation [25].

Details of all risk management frameworks that are used by various industries will be discussed. We will also discuss in depth the steps that are involved in the frameworks, activities or components that are required to effectively implement them.

2.3.2 COSO framework

According to [25], organisations have to have a risk management process of some sort, which are at times not formalised into a structure and are not coordinated. These risk management processes are sometimes found to fall short of the core principles and steps that a proper ERM process must have, such as defined by COSO. There are three steps that COSO follows in the approach to implement it as a framework in an organisation: 1) Key to Success, 2) Initial Action Steps, 3) Continuing ERM implementation [25].
Keys to Success

Firstly, in order to successfully realise the benefits of having an ERM process such as the COSO framework, there is a need for top management involvement. This means that to effectively manage risk it is imperative that ERM initiative is communicated enterprise wide and is seen as one of the strategic initiatives [25].

Secondly it is important to acknowledge that building an ERM is done through a step by step approach. Many organisations that fail in implementing COSO fail because they attempt to implement all components of ERM at once [25]. According to [26], the success of the risk management process depends on the usefulness of the management framework which lays a foundation for embedding the process across the organisation.

Initial Action Steps

There are 7 steps that are discussed by [25], which are as follows:

Step 1 is to seek board and senior management leadership, involvement and oversight.

Step 2 is the selection of a strong leader to drive an ERM initiative.

Step 3 is establishing a management risk committee.

Step 4 conducting an initial enterprise wide risk assessment and develop an action plan.

Step 5, keeping an inventory of existing risk management practices.

Step 6 involves the establishment of risk reporting.

Step 7 involves the development of the next phase of the action plan and ongoing communication.

Continuing ERM implementation

An organisation must continue to follow a step by step approach in implementing an ERM, until an organisation is comfortable with the steps and the risk management process is embedded into the culture of an organisation [25].
This will be achieved through an ongoing communication between the board of directors and senior management as well as ordinary personnel.

**Research perspective about COSO**

In Table 3 we compare the views of different authors about the COSO ERM framework. It is evident that COSO is popular globally in terms of application and also in the academic space [19, 22, 24, 26, 27].

Table 3: Research perspective of COSO framework

<table>
<thead>
<tr>
<th>Source</th>
<th>Views on COSO framework</th>
</tr>
</thead>
</table>
| [27]   | • It is one of the most cited and debated frameworks  
        • It is considered to be ambiguous and very theoretical  
        • It is one of the most followed frameworks  
        • It can be used in combination with other frameworks  
        • It defines the effectiveness of ERM through implementation of 8 components |
| [19]   | • It helps organisations manage risks  
        • It is widely applied and noticed by academics  
        • It includes 8 components |
| [22]   | • It is part of the corporate strategy  
        • It is directed top down by senior management  
        • It is an integrated ERM framework |
| [24]   | • One of the most popular risk management standards  
        • Introducing Chief Risk Officer (CRO) to assist with implementation of the framework |
| [28]   | • It encourages an integrated risk management approach  
        • Follows COSO framework in redesigning a risk framework |
| [26]   | • A non-silo based approach in risk management  
        • It links strategic objectives with organisational growth opportunities and potential risk exposure  
        • It is essential to assign an ERM authority  
        • The process of managing risk is no different from private and state owned companies  
        • It is a globally accepted ERM framework  
        • It enables organisations to better manage its overall risks exposures |

Although the COSO framework is popular in research and application, it is also one of the most debated frameworks in literature as some authors find it to be ambiguous and strictly theoretical [27].
A positive thing about the ERM framework is that it can be used in conjunction with other existing ERMs as discussed in step 5 of the initial action plan [25, 27]. COSO is an ERM that consists of eight components which must be followed in order to successfully manage risk through this ERM framework. These components must be fully functional and properly implemented as they are the criteria used to determine the effectiveness of an ERM [27].

In the views of COSO we learn that the ERM is an integrated framework that seeks involvement of senior management, the board of directors as mentioned earlier. It links strategic objectives with organisational growth opportunities and potential risk exposures. This ERM framework is known by other researchers to be providing a better approach of managing risk within an organisation as opposed to a traditional approach of managing risk. COSO is an ERM framework that is internationally accepted and used by companies and academics globally. According to COSO 2004, a process of managing risk is the same for private companies and state owned companies [25, 26, 27].

COSO framework is built around the idea that an ERM leader must be assigned to implement all eight the components outlined in Figure 2 [25]. This ERM leader does not have to be a chief risk officer who is hired precisely for the implementation of a COSO; this leader could be an existing CFO within an organisation [27].

**Dimensions and Components of COSO**

The COSO framework consists of eight components that are derived from the way management runs business and are integrated into the risk management process [19, 25, 27]. In Figure 2 are the components and dimensions of the COSO ERM sourced from [25].
An explanation of each component is as follows; 1) **Internal Environment** talks about the structure, culture and governance as well as the philosophy of risk management including risk appetite. 2) **Objective setting** focuses on the strategic objective of an organisation, its reporting and compliance activities. 3) **Event Identification** deals with identifying events that may hinder an organisation from achieving its strategic objectives. 4) **Risk Assessment** is a step where an assessment is performed about the impact of a potential risk, and how severe it can be on the objectives of an organisation. 5) **Risk Response** is the step where policies are put in place on how risk should be responded to and how it should be managed. 6) **Control Activities** are procedures and policies that are put in place to ensure that risk responses are executed. 7) **Information and Communication**; this step links all the components of ERM. 8) **Monitoring** is essential in making sure that ERM is effective and working as expected on a continuous basis [27].

### 2.3.3 ISO 31000 framework

The ISO 31000:2009 is a risk management framework which consists of principles and guidelines of managing risks; it was developed in 2009 by the International Organisation for Standards (ISO) [29]. ISO is the developer of various international standards used by many organisations. It is composed of representatives from 157 national standardisation bodies.
Research perspective about ISO 31000

According to [27], ISO 31000:2009 incorporates best practices of COSO framework and other leading international frameworks. ISO 31000:2009 framework it is not as popular as the COSO framework. Contrary to that [29] believes that ISO 31000:2009 is the most recently used risk management framework in many companies. Despite these disagreements, it is evident from the literature gathered that some articles agree that ISO 31000:2009 framework provides a structured approach and principles of risk management which intend to ensure that organisations achieve their objectives [16, 23, 30, 31].

The details of views or perspectives of various researchers are shared in detail in Table 4

Table 4: Research perspectives on ISO 31000:2009 framework

<table>
<thead>
<tr>
<th>Source</th>
<th>Views on ISO 31000 Framework</th>
</tr>
</thead>
</table>
| [27]   | • ISO 31000 incorporates best practices of COSO, Project Management Institute, AS/NZ 2004 standard, and other leading international frameworks.  
        • It is not the most preferred when compared to the COSO framework. |
| [31]   | • It provides a set of principles and a process for managing risk.  
        • It can help organisations to achieve their objectives through avoiding threats or risks.  
        • The implementation of the risk management process must exist at all levels of organisations.  
        • The alignment of risk management process with ISO 31000 will improve the implementation to be consistent and effective.  
        • The guide in implementing ISO31000 follows a PDCA cycle.  
        • The framework acknowledges that continuous improvement must be imbedded in the process.  
        • The framework manages risks with an adverse impact and with a favorable impact following the same process.  
        • ISO31000:2009 risk management steps include 5 key activities explained in the process. |
| [29]   | • Recommends ISO31000:2009 to be used in Nigeria.  
        • It is the most recently used ERM framework in many companies.  
        • It comprises of 5 key activities: 1) Communication and Consultation, 2) Establish Context, 3) Risk Assessment, 4) Risk treatment and 5) Monitoring and review. |
<p>| | |</p>
<table>
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| [16] | It provides a useful and instructive process to manage supply chain risks.  
It offers a formal approach to risk management which can be applied in supply chain management.  
It recommends ISO31000:2009 for supply chain risk management. |
| [23] | ISO 31000 is intended to assist organisations by offering an international framework that can assist in integration of risk management into their management system.  
It is important to educate managers about the frameworks and its purpose in order to benefit from it.  
Its main objective is to continually improve risk management in organisations.  
It provides a structured framework intended to meet the needs of any type of organisation.  
It assisted in developing guiding principles from literature on the implementation of the ISO 31000 framework.  
It can easily be integrated into organisations’ existing practices.  
Companies with ISO 9001 and other certifications of ISO are advantaged to easily implement ISO 31000 into their organisations.  
The standard focuses on how to address issues holistically through proper planning and management practices, while considering organisational behavior.  
It has limitations with regard to its success and implementation. |
| [30] | It covers basic risk management principles accepted internationally and used by many organisations.  
Adherence with this standard ensures a good risk management process.  
It covers the fundamental structures and processes required to implement ISO 31000.  
It can be compatible with performance principles and properly aligned.  
It requires that risk management policies are developed in an organisation.  
Executive and management involvement is important. |

In the next subsection the steps involved in the implementation of the ISO 31000:2009 framework will be discussed in detail.

Steps of ISO 31000

The ISO31000:2009 framework consists of five key activities as shown in Figure 3;  
1) Communicate and consult, 2) Establishing Context, 3) Risk Assessment, 4) Treatment of Risks, 5) Monitoring and Review. [29, 31]. These activities are the cornerstone of the ISO 31000:2009 framework, which needs to be adhered to for its successful implementation.
Step 1 Communication and Consultation:

This step is seen to be one of the critical activities of the ISO 31000:2009, since it should happen throughout the entire risk management process [23, 29]. This activity entails involving internal and external stakeholders throughout the risk management process, which strengthens team work between stakeholders and management. The accountability and responsibility of stakeholders and management will be clearly defined and understood, and will facilitate decision making based on transparency of what is happening within an organisation as far as business risk is concerned [29].

Step 2 Establishing the Context:

According to ISO 31000:2009, this activity is about setting the boundaries around the organisation’s risk appetite and risk management activities. The context of the risk management itself has to be developed that deals with ensuring that risk policies, processes, methods, plans, risk ratings criteria, roles and responsibilities, training and reporting processes, must be aligned with the organisation’s goals [29].
Step 3 Risks Assessment

As shown in Figure 3 this activity comprises of three other subactivities; 1) Risk identification, 2) Risk Analysis, 3) Risk Evaluation [29, 16]. The first activity within risk assessment aims at identifying all the potential risks which might arise from either internal or external contribution and it could have an impact on the organisation’s objective [29].

1) Risk Identification: There are tools used to perform risk identification, of which brainstorming is one of the appropriate tools used in identifying risk [20]. This step is very crucial in risk management, as it identifies potential risks that could have a negative impact on the project [20].

There are various tools and techniques to identify risks. These tools include the following:

- Document analysis
- Information gathering techniques
- Checklist analysis
- Diagraming techniques

Document analysis

This can be documents that are detailed for the project, including project plans, which can be reviewed to assess the possibility of risk [20].

Information gathering techniques

There are various information gathering techniques used in identifying risk, such as Brainstorming, Delphi technique, Interviewing, Root cause identification and SWOT analysis [20].

Brainstorming: This tool is used mostly to identify risks within the project, where there is a facilitator who allows all participants to list all possible risks to the project. Then the list of risk is filtered according to the impact the risk might have on the project [20].

Delphi Technique: Individuals from different backgrounds are given an opportunity to make a judgement based on their expertise on the project to determine the possible risks [20].
Interviewing: Interviewing stakeholders, people who are experienced in that subject can lead to identifying potential risks [20].

Root Cause Identification: Implementation of root cause analysis within the project can allow for the identification of potential risk [20].

SWOT analysis: The SWOT analysis allows the person identifying risk to understand the strengths, weaknesses, and opportunities as well as threats that might be posed to the project. This can make it easy for one to identify risk [20].

Checklist analysis

A checklist is a tool that can be developed by the organisation that is interested in capturing risks. This list can be customized according to project needs, which can cover a wide range of topics within the project [20].

Diagramming technique

Diagramming technique is another form or method used to identify risks within the project. Typically, a cause and effect diagram and process flow diagram are used to identify and capture risks [20].

2) Risk Analysis:

This activity involves a process of quantifying the magnitude of each risk already identified in the previous step [20]. This method may include a combination of qualitative and quantitative techniques. Qualitative technique is used when there is not enough data to use quantitative technique [32]. Risks are typically analysed using two perspectives; the probability of risk to occur and the risk impact. The probability of a risk is quantitative, and there is a classic table of probabilities that is developed by the risk team which is used to calculate the risk score [32]. The probability is typically defined using a mathematical equation as illustrated in

\[ p(A) = \frac{Y}{X+Y} \]

\( p(A) \) = denotes the probability of an event \( A \)

\( Y \) = illustrates the number of times that event \( A \) occurs

\( X \) = illustrates the number of times that event \( A \) did not occur

Risk is then calculated based as the product of risk consequences/impact and probability of risk occurring [8].

\[ Risk = Consequence \times Probability \]

\( Risk = c(A) \times p(A) \)

\( c(A) \) = denotes the consequence or impact of an event \( A \)
3) Risk Evaluation:

The outcome of the risk analysis is then used as an input to risk evaluation. Risk evaluation entails the evaluation of the level of risk in order to decide on how to treat the risk; this might include the use of other tools such as Pareto analysis in order to rank the risks according to their impact [20].

Step 4 Risks Treatment

According to [29] this activity is about finding ways to react to the risks that are identified. These ways include the selection and implementation of appropriate measures to prevent the risk to disrupt organisations’ objectives. Examples of risk treatment can be transfer/sharing of risk, risk avoidance, risk mitigation, or risk absorption [29]. It is important that these techniques are carefully studied before they can be taken as they might introduce new risks through failure to prevent risks.

Step 5 Monitoring and Review

In this activity the main aim is to ensure that all the identified risks are monitored to ensure that they are successfully managed through the process. This allows an organisation to learn if the risk treatment applied is successful in ensuring that the organisation is safe from risk, therefore risk performance is monitored at this stage [29]. An ERM framework will then be improved based on the return of experience from the effectiveness of all the steps involved in the risk management process.

Risk monitoring and review allows organisations to record all risks that have been identified and managed and how they were successfully managed; should they resurface, there is record on how to manage such risks [29].

2.3.4 AS/NZ 2004 framework

We have already discussed two frameworks that are internationally recognised, the third framework that is also recognised in literature is the Australian/New Zealand 4360 framework. It is denoted AS/NZ 4360, with its latest version being released in 2004 according to literature [27, 34, 19, 32, 26]. This standard is concerned about the management of risks through risk assessment and treating them in order to mitigate the level of risk to an acceptable level [35].
There are basically few researchers emphasizing the AS/NZ 4360 framework, as it is not as popular as the first two frameworks discussed. In Table 5 we have discussed some perspectives that literature has with regards to this standard.

The AS/NZ 4360:2004 has evolved since its inception in the 1990’s, however it is still not widely used according to research gathered [35]. The standard follows similar steps as that of ISO 31000:2009, which are as follows: 1) Setting goals, 2) Risk identification, 3) Risk analysis, 4) Risk assessment and prioritising, 5) Risk treatment, 6) Communication and consultation, 7) Monitoring and review. The above steps deal with exactly the same points that are discussed in the previous section. This illustrates that the frameworks are identical in terms of their process.

Table 5: Research perspective about AS/NZ 4360:2004 framework

<table>
<thead>
<tr>
<th>Source</th>
<th>Views on AS/NZ 4360:2004 Framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>[27]</td>
<td>• It is one of the most prominent frameworks.</td>
</tr>
</tbody>
</table>
| [34]   | • Risk management incorporates all company rules.  
|        | • It covers risk identification, risk analysis, risk assessment and control and response of potential risks.  
|        | • Benchmark profitability and efficiency of actions taken. |
| [35]   | • The standard considers risk management to be a process consisting of 6 steps.  
|        | • It is designed to implement a risk management program.  
|        | • It was found in the early 1990’s when risk management became necessary in many businesses in Australia and New Zealand.  
|        | • The six steps are exactly the same as the ones in ISO 31000:2009. |
| [32]   | • The implementation of this standard involves the following steps: setting goals, risk identification, risk analysis, risk assessment and prioritising, risk treatment, communication and consultation, monitoring and review. |

2.3.5 SCRM framework

Supply Chain Risk Management (SCRM) is a relatively new concept as opposed to the traditional risk management concept. SCRM is now being accepted by many industrial organisations. This is because most companies now perceive their supply chain networks as the area where opportunities of improvements are located [2]. Nowadays companies no longer compete directly against each other; however they strengthen their supply chain networks to become competitive.
With that mentioned, it is crucial for an organisation to be able to manage risks associated with its supply chain network, particularly risks associated with suppliers. This is because organisations’ performance is directly linked to that of its suppliers [8].

In Table 6, the summary of views about the supply chain risk management (SCRM) framework from various articles is shown. It is evident from the summary that SCRM is a relatively new topic in the space of risk management; however, it is becoming popular through the use of some companies that are implementing ERM to the level of the supply chain. Below are the steps that a typical SCRM framework would follow:

**Step 1: Risk Identification:**

In this step source of risk is identified and the type of risk is also identified. It is at this stage where risk management starts [36].

**Step 2: Risk Assessment**

Once risks are identified, it becomes necessary to assess the impact of this risk as well as the probability of it to occur [36].

**Step 3: Risk Prioritization**

Ranking of risk is also part of the SCRM steps, in order to prioritise which risks are addressed first.

**Step 4: Risk Sharing/Transfer/Response**

It is sometimes advised that risks are transferable or shared. This step also deals with how an organisation responds to the risks already identified. There are strategies and policies that organisations put in place to ensure risks have minimal or zero impact on business performance [18].

**Step 5: Risk Management Performance Evaluation**

It is crucial that a risk and performance profile is determined for an organisation in order to take a decision of whether or not the framework has managed to mitigate or remove the risks identified [18].
<table>
<thead>
<tr>
<th>Source</th>
<th>Views on SCRM Framework</th>
</tr>
</thead>
</table>
| [2]    | - It is a framework used to manage risk within the supply chain.  
        - It has two components: 1) Market survivability, 2) Company performance.  
        - This concept is becoming accepted by some, while some organisations are skeptical.  
        - It can assist an organisation to minimise the probability of an undesirable event.  
        - It includes Hazards risks and Operational risks.  
        - It integrates supply chain activities; risk management with a high level of information sharing and as a result it creates a high performing value chain that gives the organisation a competitive advantage.  
        - Risk Analysis, Risk Self-Assessment, Risks, Loss tracking and Key Risk Indicators, Issue management & remediation, Risk scorecards & dashboards reports are some of the steps in the SCRM process.  
        - It offers organisations a more effective risk management process. |
| [10]   | - It ensures coordination and collaboration among supply chain partners.  
        - It ensures that the business realises profit and it is sustained.  
        - It adopts the policy of 3c (coordination, collaboration and cooperation).  
        - It controls, monitors and evaluates supply chain risks. |
| [36]   | - It is about managing risks that can inhibit supply chain performance.  
        - It is a new concept in research.  
        - The three elements of SCRM are: 1) risk identification evaluation/assessment 2) global supply chain, 3) coordinated risk management strategies. |
| [37]   | - Procurement risk management is becoming SCRM.  
        - Any uncertainty in supply is managed through SCRM. |
| [18]   | - A framework that developed in supply chain management.  
        - It integrates risk and performance in supply chain.  
        - It is in its early phases of evolution.  
        - It helps derive performance metrics within an organisation.  
2.3.6 PMBOK frameworks

Project Management Body of Knowledge (PMBOK) is the standard project management guide which has been adopted and accepted globally. It is written by the Project Management Institute (PMI), an internationally renowned institute in the United States [20]. According to project management, risk is interpreted as the probability that an event will occur, and the event will have consequences on or impact the project outcome. [38].

There are various project risk management standards in practice:

1) British Standard for Project Management, BS 6079:2009,
2) Guide to the Project Management Body of Knowledge, PMBOK (Chapter 11).
3) Chapman & Ward process
4) Smith & Merritt process
5) Project Risk Analysis and Management (PRAM)
6) Risk Analysis and Management for Projects (RAMP)

Among the above listed the most popular in the South African environment is PMBOK, which follows a general risk management process outlined in Figure 4 [20, 38]. All risk management processes have their steps which are set up according to the approach of the standard.

The risk matrix shown in Table 7 quantifies the risks based on their ratings which can be used to evaluate the risks during risk assessment. This matrix is crucial to ensure that not all risks are given the same attention when attempting to resolve them. This matrix gives an idea whether the risk is high, certain, possible or low based on their impact.

Table 7: Risk matrix with ratings (Sourced from [41])

<table>
<thead>
<tr>
<th>Impact</th>
<th>Very Significant</th>
<th>Significant</th>
<th>Moderate</th>
<th>Minor</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>Possible</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>9</td>
<td>6</td>
<td>3</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>12</td>
<td>8</td>
<td>4</td>
<td>Almost Certain</td>
</tr>
</tbody>
</table>
In the case of PMBOK standard, the first step is to identify risks; prior to that, planning should have been performed. The second step is to analyse the identified risks, then evaluate those risks, and finally resolve the risks.

The process is a closed loop that continues to monitor and review risk as part of risk control in order to ensure that the execution of the five steps are implemented and benefit the organisation [20, 39]. There are no boundaries between the steps as they might overlap.

According to [40], the risk management process they developed consists of the steps shown in Figure 5. The steps are not that different from those discussed in Figure 4, the only difference is that the process does not show a continuous loop.

A summary of views from various researchers about PMBOK as a risk management framework are given in Table 8. It is seen from the summary that only two articles could be found that gave awareness about the project management book of knowledge considered as risk management framework.
Table 8: Research perspective on PMBOK framework

<table>
<thead>
<tr>
<th>Source</th>
<th>Views on PMBOK Framework</th>
</tr>
</thead>
</table>
| [20]   | • Most popular risk management approach in South Africa.  
        | • This project risk management method has the following steps: 1) Identify the risk 2) Analyse the risk 3) Evaluate the risk, 4) Resolve the risk, and 5) Monitor and review the risk. |
| [40]   | • The risk management process has five steps that are outlined as: 1) Risk identification, 2) Risk Assessment, 3) Risks Response, 4) Risks Monitoring, 5) Risk Reporting.  
        | • Risk is a product of consequences and probability.  
        | • Developed detailed risk matrix.  
        | • Recommends that project managers should be aware of the risk management process and the implementation thereof.  
        | • The risk management procedure improves efficiency in operational project handling. |

Five risk management frameworks from the literature review were discussed. The steps of how each risk management framework is executed are discussed in depth.

Now in the next section we perform a comparison of these frameworks; in order to capture their differences in terms of their application as well as their adaptation.

2.3.7 Comparison of Frameworks

Now that we have discussed the five main frameworks from literature, it is time to compare them against each other. The output of the comparison will form a base in concluding which one is the most suitable and easy to implement. Table 9, shows the comparison of the frameworks, based on their risk management steps, their popularity and whether they embrace continuous improvement or not.
Table 9: Comparison matrix of five researched risk management frameworks

<table>
<thead>
<tr>
<th>Frameworks</th>
<th>Risk Management Steps</th>
<th>Recognition</th>
<th>Continuous Improvement</th>
</tr>
</thead>
</table>
| COSO:2004      | 1. Internal Environment  
2. Objective setting  
3. Event Identification  
4. Risk Assessment  
5. Risk Response  
6. Control Activities  
7. Information & Communication  
8. Monitoring       | Very popular in academic            | Not mentioned                     |
| ISO 31000:2009 | 1. Communication & Consultation  
2. Establish the Context  
3. Risks Assessment  
4. Risks Treatment  
5. Monitoring and Review. | World-wide                        | Guide follows a PDCA cycle            |
| AS/NZ4360: 2004| 1. Setting goals,  
2. Risk identification  
3. Risk analysis  
4. Risk assessment and prioritising  
5. Risk treatment  
6. Communication and consultation  
7. Monitoring and review | Australian/New Zealand. Popular in project management | Not mentioned                     |
| SCRM           | 1. Risk Identification  
2. Risk Assessment  
3. Risk Reporting & Decision making  
4. Risk Response  
5. Risk Performance outcome       | It is a new concept in research.   | Not mentioned                     |
| PMBOK          | 1. Planning for Risk management  
2. Risk Identification  
3. Risk Analysis  
4. Risk Evaluation  
5. Resolving Risk  
6. Risk Monitoring & review       | Popular in South African environment | Closed Loop, Yes allows continuous improvement |

It is evident that all five frameworks have their unique risk management processes or steps that they follow. There are some commonalities in the steps in most of the frameworks, the common steps are: risk identification, risk assessment and risk monitoring.

From the comparison COSO is mostly applied or popular in an academic environment. ISO31000:2009 is very popular world-wide and it is guided by Plan-Do-Check-Act (PDCA) continuous improvement steps.
AS/NZ4360: 2004 is only popular in Australia and New Zealand and it is widely used in project management. SCRM framework is seen to be uncommon in industry, since it is relatively new compared to the other four frameworks. PMBOK framework is popular in the South African environment, particularly in project environment.

2.4 Chapter Conclusion

In this chapter the supplier selection process and its activities that are performed by other industries were discussed in depth. The supplier selection process demonstrated criteria that are considered when selecting suppliers. Fifteen supplier selection criteria were deduced as selection criteria that are considered key in the selection process.

Literature gave a short discussion about supplier management, which entails supplier development and supplier performance. This forms a foundation in understanding the link between the supplier selection process, risk management and supplier management.

Furthermore we discussed various risk management frameworks that are used by different industries. A comparison of five risk management frameworks was done. Findings of this literature review suggest that organisations can choose from the five risk management frameworks when attempting to put a structured risk management process within the supplier selection process.

Literature suggests that ISO31000 framework is suitable for an international organisation to provide a structured risk assessment process. In the next chapter the development of the theoretical supplier onboarding model is discussed where the link between supplier selection, supplier management and risk management framework is detailed.
CHAPTER 3: Research Methodology

3.1 Introduction
In this chapter the research methodology followed in this study is discussed. A step by step data collection procedure, instruments used and how data analysis will be done in the subsequent chapter, will also be discussed.

The lessons learnt from literature review will be discussed briefly and the supplier selection criteria that are followed by other industries from literature review will be outlined. These supplier selection criteria are then compared with supplier selection criteria that are implemented by firm Y. If there are differences between the selection criteria, it will be discussed and addressed during a pattern matching analysis in chapter 4. In the same comparison we will compare the risk assessment which is implemented by firm Y.

The research methodology used in this study includes the literature review already completed in the preceding chapter. The type of data collected here is qualitative in nature; this data are acquired through the case study methodology. This case study methodology is a single case study without an embedded design [41]. Document analysis, interviews and questionnaires are the three sources of data used in this research.

A development of a theoretical supplier onboarding model which incorporates a preferred risk management framework process is discussed in this chapter. The model will then be used to formulate questionnaires that are used to collect information and data. This model forms a basis in the construction of the recommendations based on the research results.

In the next section we discuss the roadmap of how data are collected for this research. The instruments used to collect data, the data analysis as well as data interpretation plan are also discussed in the procedure detailed in Table 10.
3.2. Research Procedure

A procedure followed to conduct the research is described in Table 10, and details of each step are given in the following subsections. In order to successfully conclude this research, a step by step procedure is defined.

Table 10: A summary of research procedure followed in this study

<table>
<thead>
<tr>
<th>STEPS</th>
<th>ACTIVITIES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Methodology</td>
<td>• Case study</td>
</tr>
<tr>
<td>2</td>
<td>Development of theoretical supplier onboarding model</td>
<td>• To assist with development of questionnaires and recommendations</td>
</tr>
<tr>
<td>3</td>
<td>Type of data</td>
<td><strong>Qualitative &amp; Quantitative data:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Descriptive data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Process review</td>
</tr>
<tr>
<td>4</td>
<td>Units of analysis</td>
<td>• Supplier selection process</td>
</tr>
<tr>
<td>5</td>
<td>Participants</td>
<td>• Sourcing director</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Site quality director</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sourcing managers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lead buyers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Supplier quality team</td>
</tr>
<tr>
<td>6</td>
<td>Population Sampling</td>
<td>• Purposive sampling</td>
</tr>
<tr>
<td>7</td>
<td><strong>Data collection process:</strong></td>
<td></td>
</tr>
<tr>
<td>7.1</td>
<td>Development of questions for data collection</td>
<td>• Attached in Appendix A</td>
</tr>
<tr>
<td>7.2</td>
<td>Data collection instruments</td>
<td>• Document Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Interviews</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Questionnaires</td>
</tr>
<tr>
<td>8</td>
<td>Data analysis plan</td>
<td>• Pattern Matching (Comparison)</td>
</tr>
<tr>
<td>9</td>
<td>Data interpretation</td>
<td>• Tables</td>
</tr>
</tbody>
</table>
3.3. Methodology

A case study is chosen as a methodology to collect qualitative data for this study, since it allows researchers to explore and understand complex issues within the research world [42]. When a holistic in depth investigation is a requirement, a case study provides a strong methodology in research. A case study is more attractive because it allows researchers to go beyond the quantitative approach and understand the behavioral settings through perspective and descriptive approaches [42].

According to [41] a definition of a case study is as follows; "A case study is an empirical enquiry that investigates a contemporary phenomenon within a real life context, especially when the boundaries between a phenomenon and context are not clearly evident". This simply means that a case study is a method that is largely used when attempting to research topics that are based on real life situations, within a specific environment, which is likely to involve crucial contextual conditions. A case study is able to assist to explain the process and outcome of a phenomenon through observations of qualitative data [42]. In some case studies an in depth examination of a single case or event is used, which provides a systematic approach of collecting data, analysing information and reporting the results [42].

Based on the fact that data collected in this study deals with a real life situation describing the supplier selection and risk assessment process, a case study methodology becomes relevant since it is the method that deals with real life situations [41]. It also allows researchers to explain the process through qualitative and quantitative data. It is therefore an appropriate method to use for this type of research.

In an attempt to address the research questions a questionnaire is developed to facilitate the collection of data from firm Y through document analysis, interviews and questionnaires.
3.4 Theoretical supplier onboarding model

In this section we define a step by step development of the theoretical supplier onboarding model using information and data acquired from the literature review. It is evident from literature that supplier selection is not an isolated subject; it is linked to risk assessment one way or another. In the development of the model, we are taking into account the relation between supplier selection, supplier development and supplier performance as well as risk management processes.

The following are steps taken in developing the model:

Step 1: An integration of supplier management process with supplier selection process is developed based on information from literature. This integration shows the link between supplier selection, supplier development as well as supplier performance management.

Step 2: This step includes the integration of step 1 with the ISO 31000 risk management process. Based on the risk management framework comparison done in the literature review, ISO 31000 is found to embrace continuous improvement and it is popular world-wide. For that reason this framework is the most suitable to be used to develop the theoretical model.

Step 1: Supplier selection and supplier management model

There are two elements of supplier management; supplier development and supplier performance which are performed after supplier selection. The process model in Figure 6 illustrates the integration of these elements.

The first step we discussed from literature is supplier selection; once it is done supplier development can commence. Once supplier development is initiated, the next step is to monitor supplier performance. Based on what has been discussed already in the literature, supplier development influences supplier performance.

The point of interest in this research is on the supplier selection process. We have included supplier development and supplier performance in this study in order to have a broader understanding of what the model should cover.
The integration shows that supplier selection must be performed first following the criteria deduced in literature review. These criteria are necessary for onboarding suppliers, as they will define if the potential supplier will be able to meet the requirements of a buying firm.

Once the supplier is selected, supplier development will commence to assist with the management of areas where there are shortfalls. Knowledge exists about the impact of supplier development on supplier performance; therefore it is necessary to group supplier development activities and supplier performance activities [14].

When suppliers have been selected and supplier development has commenced where necessary; the supplier performance should be monitored, since the performance affects the buying firm’s performance [12].

**Step 2: Integration of Supplier selection and Risk Management framework**

In section 2.3.3 the detailed process steps of ISO 31000 are outlined; these steps are integrated with the supplier selection and management process to develop a theoretical supplier onboarding model. This model is shown in Figure 7 which depicts the supplier selection process linked to ISO 31000 risk management activities.
Figure 7: Theoretical supplier on-boarding model
3.5 Research Approach

3.5.1. Type of Data
The type of data collected in this research is a combination of qualitative and quantitative data. Qualitative research allows researchers to collect data that are diverse, since it does not assume that there is one universal truth to the discovery of the research, but focuses on giving attention to the subjective experiences and stories of the people or organisation being studied [43]. The data are then converted into quantitative data to simplify the process of analysis.

3.5.2. Unit of Analysis
According to [41], a case study must have a defined unit of analysis in order to narrow the research focus into addressing the research questions. Therefore the unit of analysis for this research is the supplier selection process with firm Y. This unit of analysis will be addressed by means of collecting information about the current supplier selection process firm Y implements, and comparing it with what is deduced from the literature review.

3.5.3. Population Sampling
Sampling is known to represent a part of the population that is being studied; however population does not always refer to people [44]. Population might refer to the total quantity of cases or items which are regarded as the subject of research. There are two types of sampling methods which are commonly used; probability sampling and non-probability sampling.

In probability sampling each participant has a chance of being selected to participate through the use of a random selection procedure, [44] while in non-probability sampling there is no need for randomisation when selecting samples from the population. There are two common non-probability sampling techniques in research which are: convenience sampling and purposive sampling [44]. In this research we are utilising non-probability sampling, since it is cost effective and quicker to implement.
Convenience Sampling

In each type of research, it would be best if we use the whole population, but we know that it is impossible because the population is limited and predetermined. It is for this reason that a sampling technique such as convenience sampling is used for collecting samples that is easily accessible to researchers [44].

Purposive Sampling

The purposive technique is known to be used in qualitative research, and involves identification and selection of individuals that are well informed with the subject being studied [44]. We adopted this technique for this research, since we require participants that are informed about the subject matter.

Therefore a purposive and convenience sampling method is used in conjunction to collecting data from the participants.

3.5.4. Participants

Table 11 shows the participants that are selected to provide information and data required in this research. Information and data are collected from these participants by using three different data instruments to collect information regarding the risk assessment performed by firm Y during supplier selection process.

These participants are selected on purpose; hence a purposive technique is applied. They are selected mainly because they are informed about the current supplier selection process that firm Y is implementing, in fact they are involved in the supplier selection process implemented by firm Y, hence convenience sampling is applicable.
Table 11: Actual participants from various departments

<table>
<thead>
<tr>
<th>Department</th>
<th>Roles/Category</th>
<th>No of Participants</th>
<th>Data Instrument</th>
<th>Research Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sourcing</td>
<td>Sourcing Director</td>
<td>1</td>
<td>Interview</td>
<td>Data are available, respondent is willing to respond</td>
</tr>
<tr>
<td>Quality</td>
<td>Site Quality Director</td>
<td>1</td>
<td>Interview</td>
<td>Data are available, respondent is willing to respond</td>
</tr>
<tr>
<td>Sourcing</td>
<td>Project Sourcing Manager</td>
<td>1</td>
<td>Interview</td>
<td>Data are available, respondent is willing to respond</td>
</tr>
<tr>
<td>Sourcing</td>
<td>Sourcing Managers</td>
<td>2</td>
<td>Interview</td>
<td>Data are available, respondent is willing to respond</td>
</tr>
<tr>
<td>Sourcing</td>
<td>Lead Buyers</td>
<td>5</td>
<td>Questionnaire</td>
<td>Data are available, respondent is willing to respond</td>
</tr>
<tr>
<td>Quality</td>
<td>Supplier Product Quality Engineer</td>
<td>1</td>
<td>Questionnaire</td>
<td>Data are available, respondent is willing to respond</td>
</tr>
<tr>
<td>Quality</td>
<td>Supplier Product Quality Manager</td>
<td>1</td>
<td>Questionnaire</td>
<td>Data are available, respondent is willing to respond</td>
</tr>
<tr>
<td>Quality</td>
<td>Supplier Quality Development Manager</td>
<td>1</td>
<td>Questionnaire</td>
<td>Data are available, respondent is willing to respond</td>
</tr>
<tr>
<td>Quality</td>
<td>Supplier Development Leader</td>
<td>1</td>
<td>Interview</td>
<td>Data are available, respondent is willing to respond</td>
</tr>
<tr>
<td><strong>Total Participants</strong></td>
<td></td>
<td><strong>14</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.6 Data Collection Process and Instruments

In order to address the problem defined in section 1.2 data collection becomes an important part of this research. Therefore data collection should be done through following the steps discussed below. Data collection is prepared using structured interviews, questionnaires and document analysis. This is to ensure that triangulation can be applied to validate the information received from different sources and prove the reliability of data received. Questionnaires are designed to collect information and data; the questionnaire is derived from the literature review.

3.6.1 Questionnaire Design

In this section we describe the construction of questions used to collect data through interviews and questionnaires. The questions used are the same for both interviews and questionnaires.

Based on the list of supplier selection criteria derived in literature in section 2.1.2, the questions that were developed were aimed at asking the participants if the criteria are being considered by firm Y’s current supplier selection process. Based on the developed link between the supplier selection process and risk assessment in section 3.4, follow up questions to determine if risk assessment is performed by firm Y during supplier selection process were developed.

There are 15 questions in the questionnaire which are denoted as Q1 to Q15, these questions are aimed at addressing the current supplier selection criteria that firm Y implements during the supplier selection process. The design of the questions are structured in such a manner that the participants are given options to answer the questions with either a “yes” or “no” response. The idea is to understand if firm Y does consider any of the fifteen selection criteria that according to literature, are essential. The “yes” or “no” style of responding is compelling the participants to give one definite answer to eliminate justifications in the response which gives quantitative data. It furthermore allowed for comments to derive qualitative data from the respondents.

Appendix A shows the questionnaire used to gather information from the participants. The process that is followed by each data instrument will be discussed in the next section.
3.6.2 Semi-structured interview

Interviews are known to be popular data collection instruments in qualitative research for case studies [41]. An interview is a two-way conversation (Oral) in which the interviewer is posing questions to the participants for the purpose of gathering data. [45]. The advantage of using oral interviews is that data or information is gathered firsthand from the research participants and allows the interviewer to elaborate further if the question is not fully understood by the participants.

We are using a semi-structured interview method in this research mainly because it provides a guide of questions beforehand, which assists the interviewer not to leave out important aspects as the interview progresses. Semi-structured interviews allow the interviewer to probe and at the same time give the participants a chance to explain converse [46]. This means the researcher can also explain and rephrase the question, should the participant not understand the question fully.

In this research we considered a semi-structured interview, since it allows both the interviewer and the participants to further elaborate on the questions during the interview. It also provides the participants an opportunity to express their opinions, concerns and feelings in a natural setting.

In order to ensure that data gathered from the interviews are useful; the interview questions are asked around the two main topics of interest in the research, namely supplier selection criteria and risk assessment for each criterion.

i) Supplier selection criteria,

The interviewer asks the participants to answer Q1 to Q15 questions presented in Appendix A. These questions are designed to cover the supplier selection criteria being followed by firm Y when they perform supplier selection.

ii) Risk Assessment for each criteria,

The interviewer asks the participants to answer sub-questions within Q1 to Q15 which are also shared in Appendix A. These questions are designed to cover the supplier risk assessment during selection criteria implemented by firm Y.
In this research we planned to interview the sourcing director, sourcing managers and project sourcing managers as well as the site quality director. The reasons to select these participants are as follows:

- The participants are knowledgeable about firm Y’s supplier selection process.
- They have information targeted by the investigative questions.
- They have been in their roles for more than 1 year, which means they should understand the roles and can provide accurate information required for this research.

The requirements for a successful interview are: a quiet room and a recording device used to capture the information from the participants. The interview is designed to last maximum 30 minutes.

3.6.3 Closed–ended Questionnaires

The questionnaire is used here as an additional primary data collection instrument. A self-administered questionnaire is sent out to the participants in the form of an email to the respondents. The questionnaire was considered in this research to ensure that information and data collected are defined, easy to analyse and interpret.

The same questions that requested interviews are sent out as questionnaires to the participants.

Closed-ended questions are used here to improve response rate, since the respondents do not have to elaborate [47]. The answers to the questionnaires are a simple Yes or No and N/A, and it provides comment boxes in cases where elaboration is required. The use of closed-ended questionnaire is relevant here since this research is qualitative and we are interested in comparing the results among the users [47].

The requirements for a successful collection of information through the questionnaires are: the willingness of the participants to answer the questions honestly without a rush. This questionnaire can be answered within 30 minutes.
3.6.4 Document Analysis

Document analysis is one of the data collection methods applied in this research. The reason to use this method of data collection is mainly to ensure that data collected using interviews and questionnaires are substantiated by means of triangulation [48]. This is done through analysing the following documents:

1) Procedures and process of supplier selection
2) Procedures and process of risk assessment are performed per the selection criteria.

A checklist in Appendix B is used to substantiate the procedures of supplier selection and risk assessment.

3.7 Data Analysis Plan

Data collected from the participants are planned to be analysed using document analysis, interview analysis and questionnaires analysis. The analyses will later be consolidated by means of a pattern matching technique.

3.7.1 Document Analysis

In this analysis we focus on the information retrieved from firm Y’s documents that are implemented to facilitate the supplier selection process within sourcing. These documents are carefully read and studied to understand the current process that firm Y is implementing when conducting supplier selection process.

The main aim here is to understand if risk assessment on the supplier selection criteria is documented and instructions on how it should be done are also in place.

Documents Review

In this research the qualitative document analysis method is being used to perform document analysis. Qualitative Document Analysis (QDA) is a method for analysing written documents in a rigorous and systematic way [49]. The documents were accessed through a central point where they are stored as well as referrals from the internal employees. Firm Y granted access to the documents being reviewed in this research. In applying qualitative document analysis a simple guide was followed, which provides a four step process as shown in Table 12.
Table 12: Qualitative document analysis steps followed

<table>
<thead>
<tr>
<th>No.</th>
<th>Qualitative Document Analysis Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Setting inclusion criteria for documents</td>
</tr>
<tr>
<td>2</td>
<td>Collecting documents</td>
</tr>
<tr>
<td>3</td>
<td>Articulating key areas of analysis</td>
</tr>
<tr>
<td>4</td>
<td>Verification and Analysis</td>
</tr>
</tbody>
</table>

The above steps are used in this section to guide us on performing document analysis, and the detail of what each step is about is discussed later in this section.

Step 1: Inclusion Criteria

In this QDA we used only documents relevant to sourcing processes and risk assessment processes. We only reviewed documents which are controlled and have dates and revisions.

Step 2: Documents Collected

In this step we share the documents collected and reviewed to perform document analysis. In Table 13 we realise that there are six documented procedures that are reviewed. We then went through these documents with the goal of understanding risk assessment within the supplier selection process.

Table 13: List of documents collected and reviewed

<table>
<thead>
<tr>
<th>Document Description</th>
<th>Date</th>
<th>Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sourcing Instructions</td>
<td>16 January 2014</td>
<td>D</td>
</tr>
<tr>
<td>Supplier Selection Instructions</td>
<td>15 May 2015</td>
<td>A</td>
</tr>
<tr>
<td>Supplier Quality Manual</td>
<td>Not Dated</td>
<td>2</td>
</tr>
<tr>
<td>Supply Chain Management</td>
<td>14 September 2015</td>
<td>F</td>
</tr>
<tr>
<td>Supplier Performance Management</td>
<td>22 January 2017</td>
<td>A</td>
</tr>
<tr>
<td>Supplier Risk Management Instruction</td>
<td>23 September 2017</td>
<td>A</td>
</tr>
</tbody>
</table>

Step 3: Key Areas of Analysis

The area of analysis in this research through the documents being collected and reviewed is mainly understanding risk assessment performed by firm Y during supplier selection.

Step 4: Verification and Analysis

In this step we put together what has been collected and checked against the checklist in Appendix B. The analysis shows all fifteen supplier selection criteria that
are deduced from literature and compare them against what is documented and implemented by firm Y. These selection criteria are the same as the ones used later in interviews and questionnaires.

3.7.2 Interview and Questionnaire analysis processes

We have developed questions that are used for both the interviews and questionnaire in order to collect information about risk assessment performed within sourcing during the supplier selection process. This information or data is analysed through tables giving responses from both the interview and questionnaire participants in this research.

Interviews Process

The response rate of the interviewees is essential in providing reliability of data collected through interviews.

This in turn provides the accuracy that aims at assisting in removing the error of non-response bias, which has an impact on the research results [50].

In Table 14 we show the participants that took part in the interviews versus those that did not participate. There are four participants that were successfully interviewed, these participants are also knowledgeable with the topic and they have been working for firm Y for over 1 year. This means the information received from them can be trusted and is appropriate for this research.

Table 14: Interview participants

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Abbreviation</th>
<th>Interview Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier Development Engineer</td>
<td>SDL</td>
<td>Yes</td>
</tr>
<tr>
<td>Sourcing Manager 1</td>
<td>SM1</td>
<td>Yes</td>
</tr>
<tr>
<td>Sourcing Manager 2</td>
<td>SM2</td>
<td>Yes</td>
</tr>
<tr>
<td>Project Sourcing Manager</td>
<td>PrSM</td>
<td>Yes</td>
</tr>
<tr>
<td>Site Quality Director</td>
<td>SQ</td>
<td>No</td>
</tr>
<tr>
<td>Sourcing Director</td>
<td>SD</td>
<td>No</td>
</tr>
</tbody>
</table>

Questionnaire Process

We have sent out eight questionnaires to the participants, of which only seven were returned, where one participant did not respond. In Table 15 we see that all lead
buyers that were selected to participate, responded to the questionnaire. We also received feedback from the quality department. Therefore the information received is reliable and appropriate to proceed with the research.

Table 15: Questionnaire participants

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Abbreviation</th>
<th>Responded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier Product Quality Manager</td>
<td>SPQDM</td>
<td>No</td>
</tr>
<tr>
<td>Supplier Product Quality Engineer</td>
<td>SQPDE</td>
<td>Yes</td>
</tr>
<tr>
<td>Supplier Quality Development Manager</td>
<td>SQD</td>
<td>Yes</td>
</tr>
<tr>
<td>Lead Buyer 1</td>
<td>LB1</td>
<td>Yes</td>
</tr>
<tr>
<td>Lead Buyer 2</td>
<td>LB2</td>
<td>Yes</td>
</tr>
<tr>
<td>Lead Buyer 3</td>
<td>LB3</td>
<td>Yes</td>
</tr>
<tr>
<td>Lead Buyer 4</td>
<td>LB4</td>
<td>Yes</td>
</tr>
<tr>
<td>Lead Buyer 5</td>
<td>LB5</td>
<td>Yes</td>
</tr>
</tbody>
</table>

In processing data for both interviews and questionnaire feedback, in some instances the participants disagree with each other where some participants will give a “Yes” feedback while the other say “No”. This creates inconsistency of data received which has an impact on data interpretation. It is therefore vital that a conversion of these inconsistencies is defined, in order to make it easy to facilitate pattern matching. In Table 16 we share the conditions that should be met in order to decide if the mixed responses are conclusive or inconclusive.

Table 16: Data interpretation conversion table

<table>
<thead>
<tr>
<th>Description of the scenario</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the percentage of respondents who gave feedback that says “Yes” is greater than 50%</td>
<td>Yes</td>
</tr>
<tr>
<td>If the percentage of respondents who gave feedback that says “No” is greater than 50%</td>
<td>No</td>
</tr>
<tr>
<td>If the percentage of respondents who gave feedback that says “Yes” is equal to 50%</td>
<td>Inconclusive</td>
</tr>
<tr>
<td>If the percentage of respondents who gave feedback that says “No” is equal to 50%</td>
<td>Inconclusive</td>
</tr>
</tbody>
</table>

3.7.3 Pattern Matching

This technique is preferred, since it strengthens the validity of the data and enables us to compare and match the observed pattern in the field of data received from the research [41].
The responses from the participants are analysed to see if there is a pattern about supplier selection process and risk assessment process. This will be done by means of cross-comparing their responses from the interview, questionnaire and document analyses.

3.8 Reliability and Validity
In this research data interpretation will include reliability and validity to ensure that data are trustworthy, and can produce consistent results. [51, 52]. Validity is about usability of data and how it fits with reality; therefore it is also crucial that data collection methodology provide data that will address research questions discussed earlier [52].

3.9 Chapter Conclusion
In this chapter we discussed the methodologies used to collect data, and information to assist with analysis in chapter 4. This chapter covered a discussion of reliability and validity, and how to ensure data collected are certainly reliable and valid for this research.

The procedure that is followed in conducting this research, and activities that are carried out in this research are outlined. The questionnaire design used to collect information about firm Y’s current supplier selection process was discussed. The questionnaire designed was developed based on the information deduced from the literature review as well as the theoretical supplier onboarding model. The questionnaires and interviews presented in this chapter are prepared using information gathered from the literature review. The follow up questions that are in the questionnaire are developed based on the information discussed about the risk management process in section 2.3. The approach followed in carrying out this research is discussed, the type of data collected is defined, the unit of analysis is also discussed as well as population sampling and the participants that took part in this research were provided.

A brief discussion about data analysis plan which entails the process is detailed. A short discussion of the plan, as well as the conversion of data to simplify analysis of mixed responses from the participants was derived. The actual analysis of data collected will be performed in the next chapter.
CHAPTER 4: Analysis & Results

4.1 Introduction
This chapter is aimed at providing data analysis in order to address the current supplier selection criteria together with risk assessment implemented by firm Y during the supplier selection process. Firstly a brief case study description of the process being studied is discussed, which describes the supplier selection process that is performed by firm Y.

An analysis of data collected through interviews and questionnaires as well as document analysis is completed by applying a pattern matching technique. This technique is one of the most preferred data analysis techniques when attempting to analyse case studies [41]. It compares the pattern that is based on the research outcome from a case study with a predicted one made before data is collected.

The final research findings are presented in a table and comparative format based on the pattern matching analysis.

4.2 Case Study Description
As discussed previously, this research focuses on a case study within firm Y’s sourcing department. In this section we discuss the current sourcing process that was observed through reviewing documented processes and procedures of firm Y.

The sourcing instructions procedure is reviewed in which a detailed description of the main sourcing activities, contributors, documentation and tools related to firm Y’s sourcing management process is outlined. The sourcing instructions include all activities that required to be performed by the sourcing team when acquiring products or services from external suppliers.

There are six major steps that are implemented or incorporated in the sourcing process as shown in Table 17. As it is clear that the first step of firm Y’s sourcing process is performing supplier selection, it is relevant for this research.
We discuss in depth this step in order to provide an understanding of how supplier selection is performed by firm Y. This will allow us to make a good judgement and analysis of responses collected through interviews and questionnaires as well as document analysis. The other sourcing macro steps mentioned in the sourcing instructions as shown in Table 17 do not form part of this research. Their focus is on the management of suppliers within the sourcing process.

Table 17: Sourcing macro steps

<table>
<thead>
<tr>
<th>No</th>
<th>Firm Y's Sourcing Macro Steps</th>
<th>Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Performing supplier selection</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Manage supplier selection</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Sustain supplier performance contracts</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>Manage supplier panel</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>Manage sourcing performance</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>Ensure sustainable sourcing</td>
<td>No</td>
</tr>
</tbody>
</table>

4.2.1 Performing Supplier Selection

In this step a process of supplier selection is discussed briefly, which entails a tender management phase where suppliers are afforded an opportunity to bid.

Before a tender management process can commence, a request for purchasing (RFP) is issued to the tender leader by the sourcing team. A tender leader is usually someone who is not within the sourcing department, but within the support structure. Once the RFP is issued to the tender leader the bidding process can commence.

In the tendering step a sourcing management plan is established, validation of bid strategy and draft risk assessment performed. Also the validation of Quality, Cost and Delivery (QCD) commitments and risks assessment from the sourcing team is performed and it is a function of the sourcing management.

Supplier selection is then made once the tender gate review has been completed and all the biddings are reviewed and analysed, based on the customers’ requirements.

Supplier selection describes the main activities that are followed by sourcing when awarding business to suppliers. During this step three suppliers should be proposed, and a buyer will receive all the information regarding the purchasing request after
which suppliers will be selected based on risk assessment performed on all bidding suppliers.

4.3 Analysis

In this section the analysis of data collected through document analysis and questionnaire as well as interviews is given. The information collected through these three data instruments is summarised and form the basis in performing pattern matching.

The first analysis presented is document analysis, where the information gathered through document reviews is analysed and presented and simplified in a table format. After that the data collected through interviews and questionnaires are analysed. We then perform an overall analysis of document analysis, interviews and questionnaires through pattern matching.

Once pattern matching is completed, we are then able to formulate the results for this research.

4.3.1 Document Analysis

In this section we reviewed documents that are being implemented by firm Y within its sourcing department. The documents were reviewed against the checklist in Appendix B.

In the analysis we discovered that eight of the fifteen supplier selection criteria that were checked are not documented in any of the procedures reviewed, which implies that they are not considered by firm Y when performing a supplier selection process. The eight criteria not documented in any of the firm Y’s procedures are:

- supplier’s labour practice,
- supplier’s flexibility to demand changes,
- environmental compliance,
- supplier’s technology,
- supplier’s political stability,
- supplier sustainability,
- supplier reputation and
- supplier’s management team.
In the same documents reviewed we have seen that no risk assessment had been performed on these eight criteria, since they are not documented.

There are two additional supplier selection criteria that are considered by firm Y which were not mentioned in the list of fifteen criteria deduced from literature; which are included in Table 18. The supplier selection criteria that are considered by firm Y, yet not deduced from literature are: supplier technical performance and supplier’s supply chain.

This suggests that eight out of fifteen selection criteria being cross-checked are not considered and no risk assessment is done on them. At this stage it also means that firm Y can select potential suppliers which can become risky to conduct business with seeing that these criteria are not considered. On the other hand, firm Y has implemented two additional selection criteria that protect it from being exposed to risks related to technical performance of the supplier and overall supply chain.

Table 18: A summary of documented supplier selection criteria and associated risk assessment

<table>
<thead>
<tr>
<th>Supplier selection criteria</th>
<th>Literature Review</th>
<th>Criteria Considered by firm Y</th>
<th>Risk Assessment Documented</th>
</tr>
</thead>
<tbody>
<tr>
<td>International certification</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Quality</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cost</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Delivery</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sub-Supplier Management</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Supplier Financial Stability</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Supplier labour practice</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Flexibility to Demand Changes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Environmental Compliancy</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Supplier’s Technology</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Production and Capacity</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Political Stability</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Supplier’s sustainability</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Supplier Reputation</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Supplier’s Management team</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Technical performance</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Supply Chain</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
We now understand that there are gaps between literature and what is implemented by firm Y, based on document analysis. Pattern matching will confirm if this information is conclusive based on triangulation.

4.3.2 Interview Analysis

In this section we discuss the analysis from data that was collected through the use of interviews. It is important to note that the interviews were conducted in a setting that allowed interviewees to respond freely since they are made aware of the confidentiality of their responses.

The main purpose of this interview analysis is to discuss the information received from the interviewees about supplier selection criteria and risk assessment performed during the supplier selection process. The interviewees' understanding of the current supplier selection process is important in helping us to make a judgment about the process.

The interviews conducted are summarised in Table 19, where an analysis of the response is presented. The participants' feedback about firm Y’s supplier selection process is discussed. Based on the data conversion in Table 16 discussed in chapter 3, it is revealed from the analysis in Table 19 that there are two supplier selection criteria which received inconclusive data. The criteria that data are inconclusive are supplier's technology and supplier reputation. It is also revealed from the analysis that firm Y’s selection process does not consider a supplier’s political stability.

In this analysis we see that we have received one selection criterion with inconclusive data about risk assessment; this criterion is supplier's technology. There are three supplier selection criteria in which it is revealed that supplier risk assessment is not performed on them by firm Y. These criteria are: supplier's political stability, supplier reputation, as well as supplier's management team. In the interviews there was never any feedback or mention of supplier technical performance and supplier's supply chain criteria. At this stage we can make a significant judgment about interview analysis based on the information received and interpreted. It is noticed that information received about supplier’s technology was inconclusive in both risk assessment implementation and supplier selection criteria.
considered by firm Y. We can also deduce from the analysis that information received about supplier reputation is inconclusive based on the supplier selection criteria, however 75% of the respondents agree that there is no risk assessment performed by firm Y during the supplier selection process. It is with certainty that a supplier's political stability is not considered, hence no risk assessment is performed. We can also deduce from this analysis that a supplier's management team is considered, but no formal risk assessment is performed on it.
<table>
<thead>
<tr>
<th>Supplier selection criteria</th>
<th>Literature Review</th>
<th>Criteria considered by firm Y</th>
<th>Risk assessed by firm Y</th>
<th>Judgment on Criteria considered by firm Y</th>
<th>Judgment on Risk assessed by firm Y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>% Response (Yes)</td>
<td>% Response (No)</td>
<td>% Response (Yes)</td>
<td>% Response (No)</td>
</tr>
<tr>
<td>International certification</td>
<td>Yes</td>
<td>100%</td>
<td>0</td>
<td>100%</td>
<td>0</td>
</tr>
<tr>
<td>Quality</td>
<td>Yes</td>
<td>100%</td>
<td>0</td>
<td>100%</td>
<td>0</td>
</tr>
<tr>
<td>Cost</td>
<td>Yes</td>
<td>100%</td>
<td>0</td>
<td>100%</td>
<td>0</td>
</tr>
<tr>
<td>Delivery</td>
<td>Yes</td>
<td>100%</td>
<td>0</td>
<td>100%</td>
<td>0</td>
</tr>
<tr>
<td>Sub-Supplier Management</td>
<td>Yes</td>
<td>100%</td>
<td>0</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>Supplier Financial Stability</td>
<td>Yes</td>
<td>100%</td>
<td>0</td>
<td>100%</td>
<td>0</td>
</tr>
<tr>
<td>Supplier labour practice</td>
<td>Yes</td>
<td>75%</td>
<td>25%</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>Flexibility to Demand Changes</td>
<td>Yes</td>
<td>75%</td>
<td>25%</td>
<td>100%</td>
<td>0</td>
</tr>
<tr>
<td>Environmental Compliancy</td>
<td>Yes</td>
<td>100%</td>
<td>0</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>Supplier’s Technology</td>
<td>Yes</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Production and Capacity</td>
<td>Yes</td>
<td>100%</td>
<td>0</td>
<td>100%</td>
<td>0</td>
</tr>
<tr>
<td>Political Stability</td>
<td>Yes</td>
<td>25%</td>
<td>75%</td>
<td>25%</td>
<td>75%</td>
</tr>
<tr>
<td>Supplier’s sustainability</td>
<td>Yes</td>
<td>100%</td>
<td>0</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>Supplier Reputation</td>
<td>Yes</td>
<td>50%</td>
<td>50%</td>
<td>25%</td>
<td>75%</td>
</tr>
<tr>
<td>Supplier’s Management team</td>
<td>Yes</td>
<td>75%</td>
<td>25%</td>
<td>25%</td>
<td>75%</td>
</tr>
<tr>
<td>Technical Performance</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Supply Chain</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
4.3.3 Questionnaire Analysis

In this particular section we discuss the response received through the use of questionnaires that were sent out to participants to collect information and data regarding supplier selection criteria and risk assessment performed during the supplier selection process.

An approach followed to perform interview analysis is applied here to ensure uniform and consistent display of information. We discuss here the supplier selection criteria that are considered by firm Y during the supplier selection process. It is shown in Table 20, that there are three supplier selection criteria that are not considered by firm Y during the supplier selection process. These selection criteria are: supplier labour practice, environmental compliancy and supplier's political stability.

Even in the questionnaires there was no feedback from the participants about supplier’s technical performance and supplier’s supply chain as supplier selection criteria being considered.

The analysis further shows that risk assessment is also a concern; it is shown that six supplier selection criteria are not assessed during the supplier selection process. These selection criteria are: supplier's labour practice, environmental compliancy, supplier's technology, supplier's political stability, supplier reputation, and supplier's management team.

In the analysis outlined in Table 20 we can deduce that supplier’s labour practice, environmental compliancy, supplier’s political stability are not considered and no risk assessment has been performed on them. Furthermore we see that supplier’s technology, supplier reputation, and supplier's management team are considered by firm Y during the assessment, however there is no formal risk assessment performed on them.

In order to strengthen and conclude the findings from both document analysis, interview and questionnaire analysis, pattern matching of the three sources is conducted in the next section.
### Table 20: Questionnaire analysis summary

<table>
<thead>
<tr>
<th>Supplier selection criteria</th>
<th>Literature Review</th>
<th>Criteria considered by firm Y</th>
<th>Risk assessed by firm Y</th>
<th>Criteria considered by firm Y</th>
<th>Risk assessed by firm Y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>% Response (Yes)</td>
<td>% Response (No)</td>
<td>% Response (Yes)</td>
<td>% Response (No)</td>
</tr>
<tr>
<td>International certification</td>
<td>Yes</td>
<td>100%</td>
<td>0%</td>
<td>86%</td>
<td>14%</td>
</tr>
<tr>
<td>Quality</td>
<td>Yes</td>
<td>100%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Cost</td>
<td>Yes</td>
<td>100%</td>
<td>0%</td>
<td>86%</td>
<td>14%</td>
</tr>
<tr>
<td>Delivery</td>
<td>Yes</td>
<td>57%</td>
<td>43%</td>
<td>57%</td>
<td>43%</td>
</tr>
<tr>
<td>Sub-Supplier Management</td>
<td>Yes</td>
<td>100%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Supplier Financial Stability</td>
<td>Yes</td>
<td>100%</td>
<td>0%</td>
<td>86%</td>
<td>14%</td>
</tr>
<tr>
<td>Supplier labour practice</td>
<td>Yes</td>
<td>14%</td>
<td>86%</td>
<td>14%</td>
<td>86%</td>
</tr>
<tr>
<td>Flexibility to Demand Changes</td>
<td>Yes</td>
<td>100%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Environmental Compliancy</td>
<td>Yes</td>
<td>29%</td>
<td>71%</td>
<td>29%</td>
<td>71%</td>
</tr>
<tr>
<td>Supplier’s Technology</td>
<td>Yes</td>
<td>86%</td>
<td>14%</td>
<td>43%</td>
<td>57%</td>
</tr>
<tr>
<td>Production and Capacity</td>
<td>Yes</td>
<td>100%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Political Stability</td>
<td>Yes</td>
<td>14%</td>
<td>86%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Supplier’s sustainability</td>
<td>Yes</td>
<td>71%</td>
<td>29%</td>
<td>57%</td>
<td>43%</td>
</tr>
<tr>
<td>Supplier Reputation</td>
<td>Yes</td>
<td>86%</td>
<td>14%</td>
<td>29%</td>
<td>71%</td>
</tr>
<tr>
<td>Supplier’s Management team</td>
<td>Yes</td>
<td>100%</td>
<td>0%</td>
<td>29%</td>
<td>71%</td>
</tr>
<tr>
<td>Technical Performance</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Supply Chain</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
4.3.4 Pattern Matching

An overall analysis of the feedback received from data gathered through the use of document review, interviews and questionnaires is performed here in a form of pattern matching. Pattern matching provides us with data triangulation from three sources of data that have been analysed separately in the previous sections. This triangulation is essential for data comparison and validation of the findings.

The initial theory that we have about firm Y is that there is a problem about its supplier risk assessment performed during the supplier selection process. During pattern matching we share the research output based on the analysis and attempt to prove whether the initial theory is indeed true [41].

From the document analysis, interviews analysis and questionnaires analysis there are supplier selection criteria that are not considered, and some have received inconclusive data analysis from interviews. In this section an overall data summary will be discussed, the outputs will be compared and where there is triangulation an informed judgement can be made about the findings.

A summarised pattern matching that was observed through document analysis, interview analysis and questionnaire analysis is given in Table 21. In order to successfully complete the pattern matching, we put together the responses that we received from interviews and questionnaires as per their individual analysis.

4.4.3.1 Pattern Matching Deductions

In Table 21, it is revealed through pattern matching that some supplier selection criteria have triangulation while others do not. It is observed that supplier's labour practice, environmental compliance, flexibility to demand changes, as well as supplier technology do not have triangulation.

Pattern match shows that political stability is confirmed not considered and no risk assessment is performed on it. This is confirmed through triangulation for both risk assessment and supplier selection criteria consideration.
Table 21: Pattern matching

<table>
<thead>
<tr>
<th>Supplier selection criteria</th>
<th>Literature Review</th>
<th>Supplier selection criteria considered by firm Y</th>
<th>Risk assessment performed by firm Y on supplier selection criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Document Analysis</td>
<td>Interview Analysis</td>
</tr>
<tr>
<td>International certification</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Quality</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cost</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Delivery</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sub-Supplier Management</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Supplier Financial Stability</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Supplier labour practice</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Flexibility to Demand Changes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Environmental Compliancy</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Supplier’s Technology</td>
<td>Yes</td>
<td>No</td>
<td>Inconclusive</td>
</tr>
<tr>
<td>Production and Capacity</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Political Stability</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Supplier's sustainability</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Supplier Reputuation</td>
<td>Yes</td>
<td>No</td>
<td>Inconclusive</td>
</tr>
<tr>
<td>Supplier's Management team</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Technical Performance</td>
<td>No</td>
<td>Yes</td>
<td>Not feedback</td>
</tr>
<tr>
<td>Supply Chain</td>
<td>No</td>
<td>Yes</td>
<td>Not feedback</td>
</tr>
</tbody>
</table>
There is no triangulation that confirms whether supplier's sustainability, supplier reputation, and supplier's management team are considered as supplier selection criteria by firm Y.

The analysis shows that there is no triangulation that confirms whether risk assessment is done on supplier's sustainability or not. It is confirmed through triangulation that no risk assessment is performed on supplier reputation, and supplier's management team.

In the current supplier selection process implemented by firm Y, it is revealed through document reviews that there are two additional supplier selection criteria that are considered and risk assessment is performed on them. These selection criteria are supplier's technical performance and supplier's supply chain. Even though there is no definition given for each criterion in any of the documents reviewed, these two supplier selection criteria are not deduced from literature review.

At this stage it can be concluded that the purpose of pattern matching has been realised, which was to find out if common ground exists between the three different analyses that are carried out separately. This was to prove triangulation on the findings that have been deduced per individual analysis. It is realised that there are areas where there is no triangulation at all, and in some areas data were considered inconclusive while there are areas where there is a full triangulation.

At this stage all the information is analysed and simplified to be used in formulating the research results. Pattern matching played a vital role in providing a foundation to constructing the research findings.

4.3.5. Test Data Reliability and Validity

The triangulation technique performed here using three data instruments was crucial for data validity and reliability. The research further presents the outcomes of pattern matching to determine areas where all three sources of data correspond with each other. Pattern matching is preferred to validate the output of data analysis.
4.4 Results

The pattern matching technique assisted in the development of the research results depicted in Table 22. The results show supplier selection criteria that are confirmed to be considered by firm Y through triangulation. They also highlight supplier selection criteria that were confirmed through triangulation not to be considered by firm Y.

Table 22 further shows supplier selection criteria in which risk assessment was confirmed to be performed by firm Y. It also shows criteria in which risk assessment is confirmed not to be performed by firm Y. It is revealed from the results that there are supplier selection criteria of which the risk assessment does not include triangulation. Furthermore, the results show two supplier selection criteria that are considered by firm Y but not considered by literature.

Table 22: Research results on selection criteria and risk assessment

<table>
<thead>
<tr>
<th>Supplier selection criteria</th>
<th>Criteria considered by Literature</th>
<th>Criteria considered by Firm Y</th>
<th>Criteria which risk is performed by Firm Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>International certification</td>
<td>Considered</td>
<td>Considered</td>
<td>Performed</td>
</tr>
<tr>
<td>Quality</td>
<td>Considered</td>
<td>Considered</td>
<td>Performed</td>
</tr>
<tr>
<td>Cost</td>
<td>Considered</td>
<td>Considered</td>
<td>Performed</td>
</tr>
<tr>
<td>Delivery</td>
<td>Considered</td>
<td>Considered</td>
<td>Performed</td>
</tr>
<tr>
<td>Sub-Supplier Management</td>
<td>Considered</td>
<td>Considered</td>
<td>Performed</td>
</tr>
<tr>
<td>Supplier Financial Stability</td>
<td>Considered</td>
<td>Considered</td>
<td>Performed</td>
</tr>
<tr>
<td>Supplier labour practice</td>
<td>Considered</td>
<td>No triangulation</td>
<td>No triangulation</td>
</tr>
<tr>
<td>Flexibility to Demand Changes</td>
<td>Considered</td>
<td>Considered</td>
<td>No triangulation</td>
</tr>
<tr>
<td>Environmental Compliancy</td>
<td>Considered</td>
<td>No triangulation</td>
<td>No triangulation</td>
</tr>
<tr>
<td>Supplier’s Technology</td>
<td>Considered</td>
<td>No triangulation</td>
<td>No triangulation</td>
</tr>
<tr>
<td>Production and Capacity</td>
<td>Considered</td>
<td>Considered</td>
<td>Performed</td>
</tr>
<tr>
<td>Political Stability</td>
<td>Considered</td>
<td>Not considered</td>
<td>Not performed</td>
</tr>
<tr>
<td>Supplier’s sustainability</td>
<td>Considered</td>
<td>No triangulation</td>
<td>No triangulation</td>
</tr>
<tr>
<td>Supplier Reputation</td>
<td>Considered</td>
<td>No triangulation</td>
<td>Not performed</td>
</tr>
<tr>
<td>Supplier’s Management team</td>
<td>Considered</td>
<td>No triangulation</td>
<td>Not performed</td>
</tr>
<tr>
<td>Technical Performance</td>
<td>Not considered</td>
<td>Considered</td>
<td>Performed</td>
</tr>
<tr>
<td>Supply Chain</td>
<td>Not considered</td>
<td>Considered</td>
<td>Performed</td>
</tr>
</tbody>
</table>
Based on the research results derived through pattern match, eight out of fifteen supplier selection criteria are considered by firm Y. Six selection criteria are confirmed not to have triangulation, whereas one selection criterion is confirmed to be not considered by firm Y.

Seven of the fifteen supplier selection criteria were confirmed to have risk assessment performed on them, five selection criteria do not have triangulation while three are confirmed not to have risk assessment performed on them.

There was no evidence of how the risk management process is structured in the supplier selection process. This could be the reason why there was inconsistent feedback with regard to risk assessment, particularly during the supplier selection process.

4.5 Limitations
One of the limitations encountered in this research is receiving access to only a few documents that firm Y was willing to share as part of this research. Another limitation is the time constraint, which did not permit this research to develop a model and test it with a real life situation where a panel of suppliers are assessed through the recommended model.

4.6 Chapter conclusion
Firm Y’s supplier selection process has been studied and analysed in this chapter. Pattern matching was performed to validate the data received through document analysis, interviews and questionnaires. A deduction from pattern matching provided the base to put together the research results.

Gaps were identified between firm Y’s supplier selection criteria and the supplier selection criteria deduced from the literature review. The analysis gave awareness that firm Y implements only eight supplier selection criteria from the fifteen supplier selection criteria. It also revealed that firm Y has two additional supplier selection criteria that they consider during supplier selection which are not considered in the literature review. Furthermore the analysis confirmed that risk assessment is performed by firm Y on seven supplier selection criteria from the fifteen discussed.
CHAPTER 5: Recommendations & Conclusion

5.1 Introduction

This section concludes the research through highlighting key findings of data analysis. Recommendations will be made to mitigate the challenges that were faced during this research and explore areas for future research.

This research strived to understand and to identify areas that could be contributing to the current problem of selecting risky suppliers even though they are assessed through the current risk assessment implemented by firm Y. This is achieved through addressing the two research questions:

RQ1: What are the strategic supplier selection criteria that a firm should consider during its supplier selection process?

RQ2: How should risk assessment be performed on these supplier selection criteria?

5.2 Research Findings

In this research literature was reviewed to determine strategic supplier selection criteria used by other industries and to identify risk management frameworks which could be used to provide a risk assessment structure during the supplier selection process. Subsequently the theoretical supplier onboarding model was developed and used to develop questions to gather information regarding the current supplier selection process in firm Y.

Firm Y’s sourcing procedures were reviewed; 4 participants took part in the interviews and 7 responded to questionnaires to gather information from firm Y. All participants have been with firm Y for over 1 year, indicating that their response can be trustworthy.

The results were then analysed separately by using an Excel spreadsheet and a table format was created to simplify data analysis. From the individual table analyses of document analysis, interview analysis and questionnaire analysis, pattern matching was developed to prove triangulation among the three sources of data. A table defining the method to interpret inconsistent data was established to simplify pattern matching.
5.2.1 Supplier selection criteria that should be considered

In the available literature, several supplier selection criteria were identified and the most appropriate criteria based on their application were carefully chosen. This resulted in fifteen key supplier selection criteria deduced from literature.

Firm Y’s sourcing documents were reviewed to see which of the fifteen selection criteria are being considered during the supplier selection process. During interviews and questionnaires, participants were asked to confirm if those selection criteria were considered during the selection process.

The output of this information provided an indication that firm Y’s supplier selection process does not cover all fifteen supplier selection criteria deduced from literature. It is revealed through document analysis that the main focus of firm Y’s supplier selection process is on quality, cost and delivery as well as technicalities (QCDT).

There are eight supplier selection criteria where there is a match between literature and firm Y’s supplier selection criteria. These criteria are confirmed to be considered through pattern matching in the results in section 4.4 Table 22.

- International certification
- Quality
- Cost
- Delivery
- Sub-supplier management
- Supplier financial stability
- Flexibility to demand changes
- Production and capacity

The results presented in Table 22 also show that six of the supplier selection criteria do not have triangulation and one is confirmed to be not considered while two additional criteria were identified.
The six supplier selection criteria that do not have triangulation and are reflected to be \textit{inconclusive} based on the pattern matching are:

- Supplier labour practice
- Environmental Compliancy
- Supplier's Technology
- Supplier's sustainability
- Supplier Reputation
- Supplier's Management team

From section 4.4, one supplier selection criterion confirmed to be \textit{not considered} by firm Y's supplier selection process is:

- Supplier's political stability

To conclude this section the results revealed that there are two additional supplier selection criteria that are not covered by the available literature review, however firm Y is considering including them during the supplier selection process. These criteria are:

- Supplier's technical performance
- Supplier's supply chain

The fifteen supplier selection criteria deduced from literature cannot be considered definite, since they are not noticeably covering the two additional selection criteria.

5.2.2 \textbf{Risk assessment executed during supplier selection process}

Having discussed supplier selection criteria considered by firm Y during its supplier selection process, literature was reviewed to identify a risk management framework that could help in performing risk assessment. It is revealed that firm Y does not have a structured risk management framework; hence there are some selection criteria that are not assessed in the process.

A detailed literature about risk management frameworks is conducted, which resulted in selecting ISO 31000 risk management framework as a suitable framework to be adopted.
After carefully reviewing firm Y’s supplier risk assessment performed during supplier selection, there are seven supplier selection criteria on which risk assessment is performed during supplier selection process.

- **International certification**:
- **Quality**
- **Cost**,
- **Delivery**,
- **Sub-Supplier Management**
- **Supplier Financial Stability**
- **Production and Capacity**

Of the other eight supplier selection criteria, five do not have triangulation and three were confirmed to have been excluded from firm Y’s performance of risk assessment.

The five supplier selection criteria where risk assessment is inconclusive are:

- **Supplier labour practice**
- **Flexibility to demand changes**
- **Environmental compliancy**
- **Supplier’s technology**
- **Supplier’s sustainability**

The study shows confirmation that the following three supplier selection criteria were excluded and that risk assessment was not performed on them.

- **Supplier political stability**
- **Supplier reputation**
- **Supplier’s management team**

To fully address the risk assessment, a theoretical supplier onboarding model that was developed in section 3.4 should be used to provide structure and methods of performing risk assessment for firm Y.
5.3 Recommendations

5.3.1 Current Research Recommendations

This research has revealed that the current strategic supplier selection criteria considered by firm Y is not matching with the fifteen selection criteria.

It is discovered that the fifteen supplier selection criteria could be improved to seventeen selection criteria, taking into account two additional supplier selection criteria that firm Y consider as shown in Table 23. These criteria are used as a checklist referenced by the model.

In an attempt to improve the effectiveness of firm Y’s supplier risk assessment process; literature assisted in developing the theoretical supplier onboarding model. This model should provide a guideline on how to perform supplier risk assessment on all seventeen supplier selection criteria.

This research has explored the current firm Y’s supplier onboarding process, and recommends considering all seventeen supplier selection criteria and the use of the ISO 31000 framework to provide risk assessment structure. The fact that there are six supplier selection criteria on which this research could not provide a conclusive finding shows that the current process is not fully aligned and structured among the stakeholders. Similar to risk assessment, the research revealed that five supplier selection criteria were inconclusive.

Based on the research findings, supplier political stability, supplier reputation and the supplier management team are confirmed through analysis that they are not assessed. These three criteria could have an unfavorable impact on firm Y’s supply chain. If there is political instability in a country that firm Y is buying from, this could lead to delivery destruction. When the supplier selected has a bad reputation, they are most likely to disrupt firm Y’s supply chain. The Management team is important in implementing effective methods and processes which will have a positive impact on their organisation’s performance.

It is worth mentioning that Broad Based Black Economic Empowerment (BBBEE) criteria is not mentioned in this research, however is it being covered by firm Y as part of the requirement from the government.
5.3.2 Proposed Supplier onboarding model

It has been identified that there is a gap between supplier selection criteria deduced from literature and those that firm Y is implementing.

The proposed model suggests that a supplier selection checklist should be in place which considers all seventeen selection criteria. These criteria should be assessed through the use of the ISO 31000 risk management process. The model shows that risk assessment is linked to the supplier selection process; this is where risk identification, risk analysis and risk evaluation are performed. Before risk assessment can begin, the framework suggests that context should be established through setting boundaries, putting in place a plan and processes with risk ratings.

When consulting literature in section 2.3.3, it provides detailed steps of how risk assessment should be performed.

Once risk assessment is concluded during the supplier selection process, other risk management activities can commence which are performed during supplier development and supplier performance. This is where activities are put in place to avoid, share, transfer or mitigate all risks assessed during supplier selection. The implementation of policies on how to treat those risks is crucial.

Risk control is the last step that the model covers, even though it is not part of this research it is imperative that it is explained for the sake of understanding the model recommended.

To realise the impact this proposed supplier onboarding model will bring into firm Y’s supplier risk assessment during supplier selection, research would have to be carried out and a panel of suppliers will have to be identified that will be tested using this model.
Table 23: Updated supplier selection criteria

<table>
<thead>
<tr>
<th>Supplier Selection Criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>International certification</td>
<td>A certification of organisation that proves that companies fulfill social or environmental requirements. Usually there are standards that they comply with, such as ISO 9001.</td>
</tr>
<tr>
<td>Quality</td>
<td>Meeting the requirements of the customer according to what was stated in the purchasing specifications.</td>
</tr>
<tr>
<td>Cost or Pricing</td>
<td>A buying firm works with the budget and the cost or pricing of the supplier must be within the budget.</td>
</tr>
<tr>
<td>Delivery</td>
<td>Supplier’s ability to deliver its service or products on time in full as per the agreed schedule with the buying firm.</td>
</tr>
<tr>
<td>Sub-supplier management</td>
<td>Management of suppliers beyond tier 1 suppliers</td>
</tr>
<tr>
<td>Supplier’s financial stability</td>
<td>When the supplier is able to pay its short-term debts, and is able to stay open in the next 12 months without being considered insolvent.</td>
</tr>
<tr>
<td>Labour practice</td>
<td>In this context, labour practice refers to the consideration of workers’ rights, and exercising the basic conditions of the employment act (BCEA).</td>
</tr>
<tr>
<td>Flexibility to demand changes</td>
<td>Being able to satisfy the buying firm’s requirements in times of fluctuating demands.</td>
</tr>
<tr>
<td>Environmental compliancy</td>
<td>Green design, pollution prevention, green image, green capability, environmental systems.</td>
</tr>
<tr>
<td>Technological stability</td>
<td>This refers to technological capability of the suppliers.</td>
</tr>
<tr>
<td>Production facility &amp; capacity</td>
<td>The facility in which production will take place, and its ability to meet the buyer’s demands per demand period.</td>
</tr>
<tr>
<td>Political stability</td>
<td>A country which the buying company is buying from should be politically stable, to reduce any possible delivery disruptions.</td>
</tr>
<tr>
<td>Sustainability</td>
<td>How sustainable the supplier is in the business, looking into working conditions, wages, and its suppliers. It includes multi-criteria, some of which are covered.</td>
</tr>
<tr>
<td>Supplier’s reputation</td>
<td>Reputation for integrity, having customers that are happy with supply from a specific supplier.</td>
</tr>
<tr>
<td>Supplier’s management team</td>
<td>A strong management team to implement efficient management methods that are essential in the development of a supplier.</td>
</tr>
<tr>
<td>Technical Performance (Additional from firm Y)</td>
<td>The ability of the supplier to meet all technical requirements from the buying firm.</td>
</tr>
<tr>
<td>Supply Chain</td>
<td>All risks associated with supply chain, logistics, packaging, warehouse and material planning.</td>
</tr>
</tbody>
</table>
Figure 8: Proposed theoretical supplier onboarding model with risk management framework incorporated
5.3.3 Areas for Future Research

In order to implement a supplier risk assessment framework that is working in an organisation with a similar set up like firm Y; it is recommended that extensive research is done to substantiate supplier selection criteria to include supply chain and technicalities.

This research can be expanded to cover more subjects which can focus on the following areas:

- The impact of a supplier selection process on supplier performance using the selection criteria deduced from literature.
- The impact of supplier risk assessment on supplier performance management.
- The involvement of supplier development in improving supplier risk management.
- Testing the model with a panel of suppliers to see if the model will indeed improve the current supplier risk assessment.
- To explore more supplier selection criteria that could be considered, since the current list is not the definitive.
- To evaluate whether the industry requires all 17 supplier selection criteria to be considered and which ones are critical in this case.
5.3 Final Conclusion

This research set out to establish supplier selection criteria which should be considered and to identify how risk assessment is performed by firm Y. Literature review helped in identifying the supplier selection criteria that should be considered. Furthermore risk management frameworks were also reviewed from literature to provide structure on how to perform risk assessment.

The information gathered from literature was used to develop a theoretical supplier onboarding model. The model formed a base in designing a questionnaire which was used to collect information from participants through interviews and questionnaires. There were a few participants that could not give feedback or participate as planned which omitted their perspective. The challenge faced was when the respondents gave mixed responses which led to a development of a conversion table to simplify data interpretation.

Based on the information gathered through document analysis, interviews, and questionnaire analysis a pattern matching technique was applied. The pattern matching technique provided validity and reliability of data.

The research findings identified that one selection criteria is not considered during the supplier selection process used by firm Y. It was also found that three supplier selection criteria are not assessed through the risk assessment process. Eight supplier selection criteria agreed with literature, but only seven are confirmed to be assessed by firm Y. The research results further discussed supplier selection criteria that are inconclusive since there is no data triangulation. The BBBEE criteria is covered by firm Y as part of the requirement from the government.

Finally, the findings were discussed in detail, and a proposed supplier onboarding model was developed, focused on addressing the effectiveness of supplier risk assessment performed by firm Y. This model incorporates ISO31000 framework which detailed the steps involved in performing risk assessment.

Having this model implemented would in turn allow firm Y to address all seventeen supplier selection criteria, while providing an organised risk management framework which will allow a consistent risk assessment to be performed during the supplier selection process.
References


RESEARCH TOPIC:
ASSESSING THE EFFECTIVENESS OF SUPPLIER RISK ASSESSMENT PROCESS IN SOURCING:
A Case Study is done with Firm Y

NOTE:
• This questionnaire is designed to gather information related to the current supplier selection process performed by firm Y. It also aims at understanding how risk assessment is performed during supplier selection process. Please answer these questions with honesty as information that you provide will have an impact on the analysis and results that will be deduced from this research.

INFORMATION ABOUT THE QUESTION:
• Questions about supplier selection criteria are denoted as Q1 to Q15, and they have sub-questions [e.g. for Q1, Q1.1] which are designed to understand how risk assessment is performed for each supplier selection criteria.

INSTRUCTION ON ANSWERING THE QUESTIONNAIRE:
• Please use the dropdown arrow under the title "OPTIONS (YES/NO)" to select ONE answer.
• Please use the comment/remarks box to elaborate further.
• Remember to answer the sub-questions to each question, some sub-questions require explanation, please give a short explanation.

ETHICAL CLEARANCE:
By undertaking this questionnaire, you agree to participate in this research and you are aware that the information you provide will be treated with confidentiality.

<table>
<thead>
<tr>
<th>SUPPLIER SELECTION QUESTIONNAIRE</th>
<th>OPTIONS [YES, NO]</th>
<th>COMMENTS/REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question Description:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does your organisation require bidding suppliers to have international certification standards when selecting suppliers? Below are examples of international certifications: • ISO 9001 • ISO 14001 • Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If your answer to Q1 is yes, is your team responsible to identify if the bidder is compliant with the criteria?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If your answer to Q1.1 is yes, which standards do you consider?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1.3</td>
<td>If the criterion in Q1 is considered and a bidding supplier is not compliant, does it pose any risk to firm Y?</td>
<td></td>
</tr>
<tr>
<td>Q1.4</td>
<td>If your answer to Q1.3 is yes, how do you identify, analyse and evaluate risk associated with this particular criterion? <em>(State the tools used, or methods)</em></td>
<td></td>
</tr>
<tr>
<td>Q1.5</td>
<td>If the criterion in Q1 is considered, is there a formal procedure that you follow to assess risk?</td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td>Does <strong>Quality</strong> form part of your organisation's supplier selection criteria?</td>
<td></td>
</tr>
<tr>
<td>Q2.1</td>
<td>If the criterion in Q2 is considered, how do you identify, analyse and evaluate risk associated with this particular criterion? <em>(State the tools used, or methods)</em></td>
<td></td>
</tr>
<tr>
<td>Q2.2</td>
<td>If the criterion in Q2 is considered, is there a formal procedure that you follow to assess risk?</td>
<td></td>
</tr>
<tr>
<td>Q3</td>
<td>Does your organisation consider <strong>Cost</strong> as one of the supplier selection criteria during supplier selection process?</td>
<td></td>
</tr>
<tr>
<td>Q3.1</td>
<td>If the criterion in Q3 is considered, how do you identify, analyze and evaluate risk associated with this particular criterion? <em>(State the tools used, or methods)</em></td>
<td></td>
</tr>
<tr>
<td>Q3.2</td>
<td>If the criterion in Q3 is considered, is there a formal procedure that you follow to assess risk?</td>
<td></td>
</tr>
<tr>
<td>Q4</td>
<td>Does your organisation assess the delivery performance of the bidding suppliers during selection process?</td>
<td></td>
</tr>
<tr>
<td>Q4.1</td>
<td>If the criterion in Q4 is considered, how do you identify, analyse and evaluate risk associated with this particular criterion? <em>(State the tools used, or methods)</em></td>
<td></td>
</tr>
<tr>
<td>Q4.2</td>
<td>If the criterion in Q4 is considered, is there a formal procedure that you follow to assess risk?</td>
<td></td>
</tr>
<tr>
<td>Q5</td>
<td>Do you consider sub-supplier management as a supplier selection criterion when performing supplier selection?</td>
<td></td>
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<td>---------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Q5.1</td>
<td>If the criterion in Q5 is considered, how do you identify, analyze and evaluate risk associated with this particular criterion? <em>(State the tools used, or methods)</em></td>
<td></td>
</tr>
<tr>
<td>Q5.1</td>
<td>If the criterion in Q5 is considered, is there a formal procedure that you follow to assess risk?</td>
<td></td>
</tr>
<tr>
<td>Q6</td>
<td>Does your organisation consider financial stability of the bidding suppliers when performing supplier selecting process?</td>
<td></td>
</tr>
<tr>
<td>Q6.1</td>
<td>If the criterion in Q6 is considered, how do you identify, analyse and evaluate risk associated with this particular criterion? <em>(State the tools used, or methods)</em></td>
<td></td>
</tr>
<tr>
<td>Q6.2</td>
<td>If the criterion in Q6 is considered, is there a formal procedure that you follow to assess risk?</td>
<td></td>
</tr>
<tr>
<td>Q7</td>
<td>Do you consider labour practice at the suppliers when performing supplier selection?</td>
<td></td>
</tr>
<tr>
<td>Q7.1</td>
<td>If the criterion in Q7 is considered, how do you identify, analyse and evaluate risk associated with this particular criterion? <em>(State the tools used, or methods)</em></td>
<td></td>
</tr>
<tr>
<td>Q7.2</td>
<td>If the criterion in Q7 is considered, is there a formal procedure that you follow to assess risk?</td>
<td></td>
</tr>
<tr>
<td>Q8</td>
<td>Is the ability of suppliers to be flexible to demand variation considered in your organisation when performing supplier selection process?</td>
<td></td>
</tr>
<tr>
<td>Q8.1</td>
<td>If the criterion in Q8 is considered, how do you identify, analyze and evaluate risk associated with this particular criterion? <em>(State the tools used, or methods)</em></td>
<td></td>
</tr>
<tr>
<td>Q8.2</td>
<td>If the criterion in Q8 is considered, is there a formal procedure that you follow to assess risk?</td>
<td></td>
</tr>
<tr>
<td>Q9</td>
<td>Does the sourcing selection process consider bidding suppliers behavior towards environmental compliancy according to ISO 14001?</td>
<td></td>
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<tr>
<td>-----------</td>
<td>--------------------------------------------------------------------------------------------------------------------------</td>
<td>---</td>
</tr>
<tr>
<td>Q9.1</td>
<td>If the criterion in Q9 is considered, how do you identify, analyse and evaluate risk associated with this particular criterion? <em>(State the tools used, or methods)</em></td>
<td></td>
</tr>
<tr>
<td>Q9.2</td>
<td>If the criterion in Q9 is considered, is there a formal procedure that you follow to assess risk?</td>
<td></td>
</tr>
<tr>
<td>Q10</td>
<td>Does your organisation consider technological stability <em>(having latest technology e.g. Software, machines, and product lines)</em> of bidding suppliers an important criteria when performing selection process?</td>
<td></td>
</tr>
<tr>
<td>Q10.1</td>
<td>If the criterion in Q10 is considered, how do you identify, analyse and evaluate risk associated with this particular criterion? <em>(State the tools used, or methods)</em></td>
<td></td>
</tr>
<tr>
<td>Q10.2</td>
<td>If the criterion in Q10 is considered, is there a formal procedure that you follow to assess risk?</td>
<td></td>
</tr>
<tr>
<td>Q11</td>
<td>Do you consider production facility and capacity a selection criterion that bidding suppliers must have when performing supplier selection process?</td>
<td></td>
</tr>
<tr>
<td>Q11.1</td>
<td>If the criterion in Q11 is considered, how do you identify, analyse and evaluate risk associated with this particular criterion? <em>(State the tools used, or methods)</em></td>
<td></td>
</tr>
<tr>
<td>Q11.2</td>
<td>If the criterion in Q11 is considered, is there a formal procedure that you follow to assess risk?</td>
<td></td>
</tr>
<tr>
<td>Q12</td>
<td>During supplier selection some buying firms consider challenges such as political stability of that country before they can enter into a business agreement with the supplier, especially when buying outside the country. Is this the case with your organisation?</td>
<td></td>
</tr>
<tr>
<td>Q12.1</td>
<td>If the criterion in Q12 is considered, how do you identify, analyse and evaluate risk associated with this particular criterion? <em>(State the tools used, or methods)</em></td>
<td></td>
</tr>
<tr>
<td>Q12.2</td>
<td>If the criterion in Q12 is considered, is there a formal procedure that you follow to assess risk?</td>
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<td>-------</td>
<td>---------------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Q13</td>
<td>Does your supplier selection process consider <strong>Sustainability</strong> of bidding suppliers?</td>
<td></td>
</tr>
<tr>
<td>Q13.1</td>
<td>If the criterion in Q13 is considered, how do you identify, analyse and evaluate risk associated with this particular criterion? <em>(State the tools used, or methods)</em></td>
<td></td>
</tr>
<tr>
<td>Q13.2</td>
<td>If the criterion in Q13 is considered, is there a formal procedure that you follow to assess risk?</td>
<td></td>
</tr>
<tr>
<td>Q14</td>
<td>Do you consider the reputation of the bidding suppliers when performing supplier selection?</td>
<td></td>
</tr>
<tr>
<td>Q14.1</td>
<td>If the criterion in Q14 is considered, how do you identify, analyse and evaluate risk associated with this particular criterion? <em>(State the tools used, or methods)</em></td>
<td></td>
</tr>
<tr>
<td>Q14.2</td>
<td>If the criterion in Q14 is considered, is there a formal procedure that you follow to assess risk?</td>
<td></td>
</tr>
<tr>
<td>Q15</td>
<td>Do you consider the strength of <strong>Management team</strong> of the bidding suppliers when performing supplier selection suppliers?</td>
<td></td>
</tr>
<tr>
<td>Q15.1</td>
<td>If the criterion in Q15 is considered, how do you identify, analyse and evaluate risk associated with this particular criterion? <em>(State the tools used, or methods)</em></td>
<td></td>
</tr>
<tr>
<td>Q15.2</td>
<td>If the criterion in Q15 is considered, is there a formal procedure that you follow to assess risk?</td>
<td></td>
</tr>
</tbody>
</table>
### RESEARCH TOPIC:
**ASSESSING THE EFFECTIVENESS OF SUPPLIER RISK ASSESSMENT PROCESS IN SOURCING:**
A Case Study is done with Firm Y

## DOCUMENT REVIEW CHECKLIST

<table>
<thead>
<tr>
<th>No.</th>
<th>DESCRIPTION</th>
<th>YES</th>
<th>NO</th>
<th>DOCUMENT REFERENCE NAME</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Did firm Y have a formal procedure that outlines the main selection criteria to check when performing supplier selection?</td>
<td>X</td>
<td></td>
<td>Sourcing Instructions</td>
</tr>
<tr>
<td>2</td>
<td>Is there a formal procedure that explains how the international certification of suppliers is checked during supplier selection and how the risk is assessed for this criterion?</td>
<td>X</td>
<td></td>
<td>Supplier Selection Instructions</td>
</tr>
<tr>
<td>3</td>
<td>Is there a formal procedure that explains how Quality of suppliers is checked during supplier selection and how the risk is assessed for this criterion?</td>
<td>X</td>
<td></td>
<td>Supplier Quality Manual</td>
</tr>
<tr>
<td>4</td>
<td>Is there a formal procedure that explains how Cost is checked during supplier selection and how the risk is assessed for this criterion?</td>
<td>X</td>
<td></td>
<td>Supplier Selection Instructions</td>
</tr>
<tr>
<td>5</td>
<td>Is there a formal procedure that explains how Delivery is checked during supplier selection and how the risk is assessed for this criterion?</td>
<td>X</td>
<td></td>
<td>Supplier Selection Instructions</td>
</tr>
<tr>
<td>6</td>
<td>Is there a formal procedure that explains how Sub-supplier management is checked during supplier selection and how the risk is assessed for this criterion?</td>
<td>X</td>
<td></td>
<td>Supplier Selection Instructions</td>
</tr>
<tr>
<td>7</td>
<td>Is there a formal procedure that explains how a Supplier's financial stability is checked during supplier selection and how the risk is assessed for this criterion?</td>
<td>X</td>
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<td>8</td>
<td>Is there a formal procedure that explains how Labour practice is checked during supplier selection and how the risk is assessed for this criterion?</td>
<td>X</td>
<td></td>
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<td>9</td>
<td>Is there a formal procedure that explains how Flexibility to demand changes is checked during supplier selection and how the risk is assessed for this criterion?</td>
<td>X</td>
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<td>10</td>
<td>Is there a formal procedure that explains how Environmental compliancy are checked during supplier selection and how the risk is assessed for this criterion?</td>
<td>X</td>
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<td>11</td>
<td>Is there a formal procedure that explains how <strong>Technological stability</strong> of suppliers is checked during supplier selection and how the risk is assessed for this criterion?</td>
<td></td>
<td>X Not documented</td>
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<td>12</td>
<td>Is there a formal procedure that explains how <strong>Production facility &amp; capacity</strong> of suppliers is checked during supplier selection and how the risk is assessed for this criterion?</td>
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<td>Supply Chain Management</td>
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<td>13</td>
<td>Is there a formal procedure that explains how <strong>Political stability</strong> of suppliers is checked during supplier selection and how the risk is assessed for this criterion?</td>
<td></td>
<td>X Not documented</td>
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<td>14</td>
<td>Is there a formal procedure that explains how <strong>Sustainability</strong> of suppliers is checked during supplier selection and how the risk is assessed for this criterion?</td>
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<td>15</td>
<td>Is there a formal procedure that explains how a <strong>Supplier's reputation</strong> is checked during supplier selection and how the risk is assessed for this criterion?</td>
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<td>16</td>
<td>Is there a formal procedure that explains how a <strong>Supplier's management team</strong> is checked during supplier selection and how the risk is assessed for this criterion?</td>
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<td></td>
<td>Are there <strong>additional criteria</strong> that firm Y covers that are not listed above? List them below:</td>
<td></td>
<td>Supplier Selection Instructions</td>
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### Appendix C

Table 26: Primary data for supplier selection criteria

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<th>Supplier Selection Criteria</th>
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<th>SPQDE</th>
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<th>LB5</th>
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**NOTE:** The columns highlighted in grey represent incomplete data, due to lack of responses from the questionnaire and availability of interviews.
### Table 27: Primary data for risk assessment

Selection criteria that respondents says are assessed through risk assessment by firm Y

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<th>Supplier Selection Criteria</th>
<th>Questionnaires</th>
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<td>Supplier's Management team</td>
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**NOTE:** The columns highlighted in grey represent incomplete data, due to lack of responses from the questionnaire and availability of interviews.