EVALUATION OF SUPPLY CHAIN RISK MANAGEMENT INVOLVED IN OIL INDUSTRIES

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Further, I certify that the work is based on the investigation made, data collected and analyzed by him and it has not been submitted in any other University or Institution for award of any degree. In my opinion it is fully adequate, in scope and utility, as a dissertation towards partial fulfillment for the award of degree of MBA.

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TABLE OF CONTENTS

TABLE OF CONTENTS

Dissertation by: Kapil Kumar
DISSERTATION TOPIC – EVALUATION OF SUPPLY CHAIN RISK MANAGEMENT INVOLVED IN OIL INDUSTRIES.

LIST OF TABLES & FIGURES

EXECUTIVE SUMMARY

Report focuses on the Supply Chain Risk management involved in Oil Industries. In this we will analysis the root causes which are affecting the Complete SCM Process. At First we will review the Procurement management, its importance and risk management in term of Survey and Analysis .The reports will contain the Methods & tools generally using for the Solution.

CHAPTER 1

INTRODUCTION

Supply- chain management (SCM) can be defined as the configuration, coordination and continuous improvement of a sequentially organized set of operations. The goal of supply- chain management is to provide maximum customer service at the lowest cost possible. A customer is anyone who uses the output of a process. Therefore, the customer's customer is important to any organization that is focused on customer service. In a supply-chain, a company will link to its suppliers upstream and to its distributors downstream in order to serve its customers. Usually, materials, information, capital, labor, technology, financial assets and other resources flow through the supply-chain. Since the goal of the firm is to maximize profits, the firm must maximize benefits and minimize costs along the supply-chain. The firm must weigh the benefits versus the costs of each decision it makes along its supply-chain. Supply-chain management is therefore an extension of the focus on customer service.

Today, there are more opportunities for coordinating activities across a supply-chain even in such complex operations as oil, because of improving information systems and communication technologies. Integrating operations management with other functions of the operation allows all functions to be involved in the supply-chain management decisions.

1.1 IMPORTANCE OF SUPPLY CHAIN MANAGEMENT IN OIL INDUSTRIES:

1.1.1 SUPPLY-CHAIN LINK IN THE OIL INDUSTRY

Exploration → Production → Refining → Marketing → Consumer

The links shown above represent the major supply-chain links in the oil industry. The links represent the interface between companies and materials that flow through the supply-chain. As long as oil companies have needed a phalanx of vendors to keep their systems continuously re-supplied, there has been a supply-chain. Within each stage there are many operations. For example, exploration includes seismic, geophysical and geological operations, while production operations include drilling, reservoir, production, and facilities engineering. Refining is a complex operation and its output is the input to marketing. Marketing includes the retail sale of gasoline, engine oil and other refined products. Each stage of the link can be a separate company or a unit of an integrated firm. The common issue along the links in the oil industry supply-chain is economics, weighing benefits versus costs along the chain.

In the oil industry, almost all significant and important operations are planned in advance. Thus, the whole process can be massaged and fine-tuned into a high performance money making machine. The goal of supply-chain management is to provide maximum customer service at the lowest possible cost. In the industry supply-chain link, exploration operations create value through seismic analysis and identifying prospects. Production operations become the customers that use the output of exploration. In like manner, refining is the customer of production while marketing is the customer of refining and the consumer of refined products such as gasoline is the ultimate customer.

One of the weaknesses of a supply-chain is that each company is likely to act in its best interests to optimize its profit. The goal of satisfying the ultimate customer is easily lost and opportunities that could arise from some coordination of decisions across stages of the supply-chain could also be lost. If suppliers could be made more reliable, there would be less need for inventories of raw materials, quality inspection systems, rework, and other non-value adding activities, resulting in lean production.

1.1.2 Procurement

Role of procurement and supply management has swiftly risen where procurement is associated with efficient purchase orders (PO) processing. In a rapidly changing environment, a disciplined approach, as well as adequate understanding and deployment of new strategy and technology is needed to decisively manage business relationships. There are various activities involved with procurement support companies' goal to realize business values. These activities can be by providing human resources, purchasing inputs, technology, raw materials, machinery, suppliers, and office equipment.
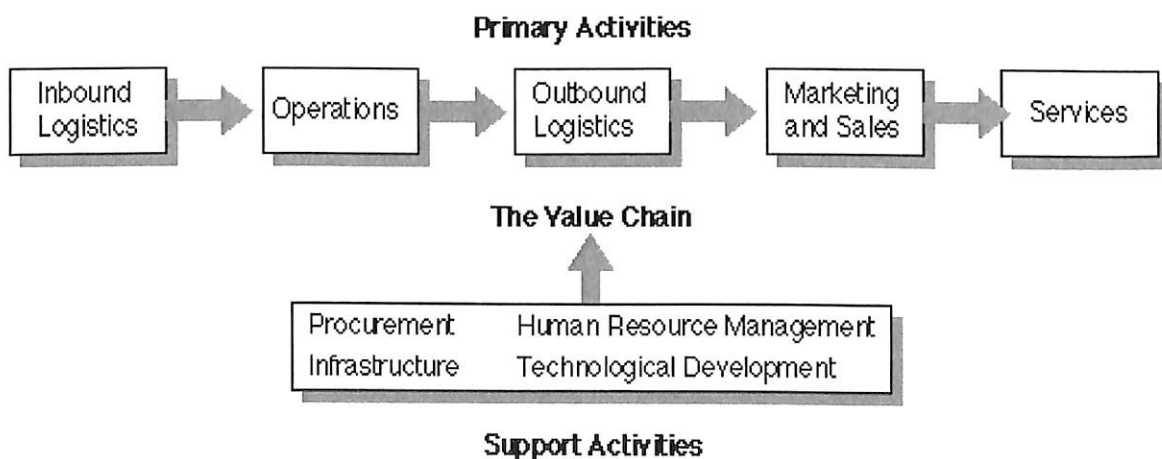
Figure 1. Value Chain Diagram

Value chain initiative is focused on the view of organization process, which sees a service organization as a system that comprises of other sub-systems each with inputs, transformation processes and outputs. These involve gaining and utilization of resources such as labor, money, materials, building, land, management, equipment, and administration. The value chain activities engagements are dependent on costs and profits. In most organizations, some activities are embarked upon with the aim of transforming inputs into outputs. This number of activities can be categorized as primary and support activities that all organization tends to engage in one way or the other.

1- Primary activities such as:

A. **Inbound logistics-** This involves relationships with suppliers and includes all the activities required to receive, store, and disseminate inputs.

B. **Service –** This includes all the activities required to keep the product or service working effectively for the buyer after it is sold and delivered.

C. **Outbound logistics -** includes all the activities required to collect, store, and distribute the output.

D. **Marketing and Sales –** activities include informing buyers about products and services, induce buyers to purchase them and facilitate their purchase.

E. **Operations -** Include all the activities required to transform inputs into outputs (products and services).

2- Support activities such as:

A. **Procurement -** is the acquisition of inputs, or resources, for the firm.

B. **Infrastructure -** serves the company's needs and ties its various parts together. It consists of functions or departments such as accounting, legal, finance, planning, public affairs, government relations, quality assurance and general management.

C. **Technological Development -** pertains to the equipment, hardware, software, procedures and technical knowledge brought to bear in the firm's transformation of inputs into outputs.

D. **Human Resource Management -** consists of all activities involved in recruiting, hiring, training, developing, compensating and dismissing or laying off personnel

1.1.3 Procurement Risk Management (PRM)

In Short risk is the probability of incurring loss or misfortune like a break in Supply Chain.

Procurement Risk Management (PRM), can be described with these four states:

1. Ignorance: Neglecting actions when it's needed urgently.

2. Responsiveness: Risk identification comes from asking 'what if ?' questions- being streetwise and creative, learning from past incidents, and knowing where to look.

3. Evaluation: Assessing impact and probability in a structured and consistent way.

4. Risk Management: Appropriate measures are in place to contain or mitigate impact or to compensate for loss, plus regular reviews, and receptiveness to supply chain alerts.

1.1.4   Risk Management in the Oil Industry

International supply chains are much exposed to risks than domestic chains. This disadvantage is due to the links connecting an international network of companies involved in the procurement operation. As companies always aim to reduce cost, source the right vendor, inventory management, lean operations, and reduce outsourcing. These aims can be achieved in a stable environment; however, this may change to risks once the supply chain extends to international complex supply chains.
Risks drivers which increase the complexity of supply chain are:

- Outsourcing
- Integrated manufactories and distributors.
- Efficiency
- Reduce improper suppliers.
- Labour strike, fire, terrorist attack and natural disasters

CHAPTER 2

Literature Review

2.1 Business planning and project strategy:-

In this phase, the decision to start exploring the feasibility of developing a project is made. Reasons to start a project could be a future lack of capacity in a certain installation or the indication of a producible oil field.

2.2 Front End Development (FED):

The main goal of FED is to provide the owner with a sufficiently complete image of the project to enable them to decide whether the project is worth investing resources. In the oil industry, it is a common practice to divide the front-end development phase into three stages, FED 1, 2 and 3. These represent assessment, selection and definition of the project (depending on the source used) respectively. The rationale behind the extensive FED is that the impact of changes on project cost in an early stage is minimal, while changes in the course of the project have a much higher influence on project price. The FED phase should eliminate changes and optimize project schedule, cost effectiveness, safety, and functionality.

2.3 Implementation and operational readiness:

In this phase, the main engineering operation (construction, drilling, etc.) takes place. Often a project is placed on the market as a competitive tender. The FED 3, drafted by an external (Eng. & Construction) EC, serves to communicate the requirements from the customer. A FED package is typically detailed to a functional level. It is to the construction company to specify exact materials, methods and machinery. The delineation to where the FED stage stops and where tendering by a construction company starts, depends on the client, type of project and envisaged contract form for the works.

2.4 Supply Chain Management (SCM) and suppliers:

During the last few years, informed development in SCM especially in the oil industry has advanced as one of the most important aspects of industrial operations. The increased interest of researchers in this area of study shows its importance in the current business world. SCM can be referred to as the means of devising methods and series of steps in the business where goods and services move between suppliers, processed into finished goods then through to the final consumers. It involves information transfers between these supply chain entities.

Supply chain management as the process of managing the chain of activities involved in the transition of goods and services from the manufacturer to the final customer. These activities can include planning, coordination and control. It is important to explain here that, a typical supply chain will be made up of several components/entities with complex interactions among them. The individual entity will also have their organizational structure and functional relationships with other entities. The relationship between entities in a supply chain can be in the form of logistics, information flow, warehouse management, manpower employment etc.

2.5 Supply Chain Risk (SCR):

In a project environment, a risk is considered to be any potential deviance from the operations set target and specifications. Risk is usually associated with other terms such as the unknown, unpredictability and uncertainty. It can brief as the likelihood and impact of unexpected macro and/or micro level events or conditions that adversely influence any part of a supply chain leading to operational, tactical, or strategic level failures or irregularities.

Macro-risks refer to rare external events or situations which usually have negative impacts on companies. It may consist of natural risks (e.g. weather-related disasters or Like Covid-19) or man-made risks (e.g. war, terrorism and political situation). Simultaneously, micro-risks refer to events originated directly from internal activities of companies and relationships within partners in the entire supply chain. In generally, macro-risks have much greater negative impact on companies in relation to micro-risks.

2.6 Risk Mitigation:

This section discusses the classifications of risk mitigation methods such as demand risk mitigation, macro risk mitigation, supply chain, manufacturing, financial, transportation, information & general risk mitigation methods.

2.6.1 Manufacturing risk mitigation

The area of manufacturing risk mitigation considering various aspects of manufacturing risk factors. When Focused on risk quality while lead time uncertainty in term of manufacturing risk has been considered. Based on research on random yield risk unlike non-conforming product design So machine failure as a form of risk, and capacity inflexibility.

2.6.2 Supply risk mitigation

When it comes to supply chain risk mitigation, the decision to outsource services becomes paramount. In literature, research has been done to determine the optimal number of suppliers needed in case of disastrous risks, as it was established that extra suppliers would be required, as the extent of the risk involved increases. On the other hand, even if there are more additional suppliers to tackle the risk, We questioned suppliers' reliability.

As a result of the conclusion of the outcome of these methods, suppliers were found to have high probability to disrupt supply chain. However, order allocation is said to be influenced by supplier's cost than actual likelihood of supplier's failure.

2.6.3 Transportation risk mitigation

Based on study related to risk mitigation, only one research is found on transportation risk reduction. which developed an integer nonlinear programming model to determine the optimal production and order quantities for the supplier and retailer, and the duration for recovery subject to transportation disruption, which produces the minimum relevant costs of the system. The outcome revealed the dependency of the optimal recovery schedule on the relationship between the backorder cost and the lost sales cost parameters. The study was based on a simple two-tier supply chain between one supplier and one retailer and assumed the demand to be deterministic.

2.6.4 Information risk mitigation

The research on information risk is found in Du et al. (2003) who proposed companies to construct attribute correspondence matrices for databases to share data with both upstream and downstream supply chain partners, hereby securing information away from competitors. However, the work only focuses on the vertical relationships of companies, while ignoring the horizontal relationships of new partners. In another view We studied the potential of data transfer in producing enterprises risk in retail SC association, and suggest a relationship rule hiding algorithm to remove sensitive knowledge from the released database, and minimize misrepresentation of data.

2.7 Supply Chain Risk management (SCRM) procedures or approaches

Research related to the SCRM approaches are found in some articles that have adopted qualitative approaches.

Five major steps involved in SCRM approaches are identified. They are:

o Supply chain risk analysis

o Risk types and factors identifications

o Assessment of probability of occurrence and overall impact

o Selection and implementation of risk mitigation strategies

o Continuous improvements

For the brief Explanation of risk Management:
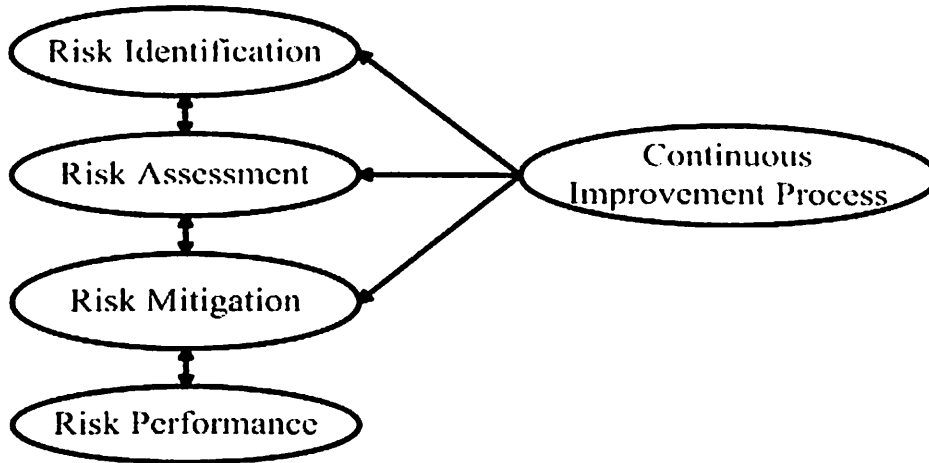
Figure 2. Risk Management Process

2.8 SUMMERY:

This chapter presented the terms of definition, types, factors and SCRM methods. The critical review of different definitions of SC risk and SCRM has been used to frame new one for the concepts that is clear to researchers and practitioners. Few common risks have been identified to associate with supply chain risk. They are classified as macro risk, demand risk, manufacturing risk, supply risk, and infrastructural risk (information risk, transportation risk, and financial risk). This comprehensive classification could help researchers and practitioners identify various risk types with differing degrees of impact that are both external and internal to supply chains.

Further, in this chapter, both quantitative and qualitative SCRM methods have been discussed based on identified SCRM processes such as risk identification, risk assessment, risk mitigation, and risk monitoring. These are emphasized to provide valuable understandings to researchers and practitioners for SCRM, such as which methods (qualitative against quantitative; individual and integrated) are applicable in particular SCRM processes.

CHAPTER 3

Research Design, Methodology & Plan

3.1 Introduction:

In this chapter, different methods of analysis, procedures and techniques for data processing will be discussed. The risk factors influencing management of supply chain will be investigated along with the process for materials procurement operations.

This chapter begins with a general overview of research design and the philosophy behind the concept, and studies various research approaches. Next, the chosen research method for this research will be explained and justified. The chapter will also explore the design, structure and content for the chosen data collection methods for this research; which are; questionnaires and semi-structured interviews. Any issues with the data collection methods will also be explored.

3.2 Research Philosophy:

Research philosophy refers to the way the researcher reflects on the development of knowledge. Western academic literature is dominated by two main research philosophies; positivism and phenomenology (Collis and Hussey 2003). Both these philosophies vary in assumptions and methodological implications, and interpret the social world in various ways. By researching the philosophy of this research, one can decide which research approach, strategy, data collection and data analysis techniques are best suited to the research. Easterby-Smith et al. (2002) believes philosophical issues should be recognised in order to:

- Clarify research designs
- Help researchers decide which design to choose the philosophy can help understand the limitations of some approaches
- Enable researcher to create designs that they have not done so previously; it can also provide researchers to adopt previous research designs to different subjects.

This positivism philosophy is characterized by five main features, deductive explains key relationships between variables, utilizes quantitative data, allows the testing of hypotheses and uses a structured methodology to facilitate replication.

Whereas, a phenomenological approach is portrayed as the meaning attached to social phenomena by research subjects. This approach regards reality as being not just objective but also socially constructed. A phenomenological researcher's main aims is to understand what is happening and why; therefore, the context in which events take place is considered very crucial in this approach. A phenomenological researcher's main method for obtaining data is by

undertaking accurate, lengthy interviews to obtain qualitative data from a select group of participants.

I described the key differences between the two models; the positivistic approach is considered to be more traditional, quantitative and "scientific"; whereas the phenomenological approach is more modern, subjective, and qualitative and driven by social interactions. Many philosophers have argued as to which approach is best used. In recent times, many researchers prefer to use a combination of both in order to come to a conclusion that both models reinforce.

3.3 Types of Research Methods:

Within a positivistic philosophy there are three main types of research methods; quantitative, qualitative and mixed methods. A short description of each of these methods will be described below:

3.3.1 Quantitative research:

This method is best used to establish key relationships between variables and to examine detailed hypotheses. Researchers often use statistical methods in order to evaluate and derive key relationships between variables. Quantitative research can also be used to seek previously identified variables and implement in the current research. The main strategy of obtaining quantitative data is through the use of questionnaires and interviews. Easterby-Smith (1991) stated that like all approaches quantitative approach has many strengths and weaknesses. These are outlined below:

Strengths

- Can be used to cover a wide variety of situations and variables,
- Fast and economical,
- Interprets large samples of data using statistics in order to derive results that may be considered relevant to policymakers.

Disadvantages

- The method tends to be rigid and artificial,
- Processes are sometimes not understood well
- The significance that people attach to actions are not well recognised using this method
- Can be difficult for policy makers to understand what changes and actions are required as a result of the data.

Even with all the disadvantages, quantitative methods are still the preferred method for many studies involving social sciences due to its efficiency, ease of use, organization and generalisation of the data collected and scientific approach being able to organise the data collected.

3.3.2 Qualitative Research:

A process of enquiry that draws data from the context in which events occur, in an attempt to describe these events, as a means of determining the process in which events are conducted and the perspectives of those participating in the events, using induction to derive possible explanations based on observed phenomena. So "Qualitative research aims to provide an in-depth understanding of people's experience, perspectives and histories in the context of their personal circumstances or setting". In comparison to the quantitative approach; which can often be restricting, the qualitative approach makes it's easier for researchers to explore wonders in an unnatural environment. A qualitative approach expresses data as words instead of numbers, it also accentuates description and discovery, and focuses less on hypothesis testing and corroboration.

This approach utilises many data collection methods; such as; case studies, interviews, group discussion, participant observation and documents and records analysis. The main strengths of qualitative research is that specific responses can be identified and simplified; especially responses relating to the views and opinions of the participants in order to provide an understanding into the organizational climate. This approach also allows researchers to obtain an in depth insight into people and situations.

3.3.3 A mixed, multi-methods approach

In modern times, it is very rare to find research that follows one specific research philosophy; i.e. positivism with a quantitative approach or phenomenology with a qualitative approach. The majority of studies use a mixture of both. It is more appropriate to combine approaches. Easterby-Smith (1991) reasoned that sometimes it is very hard to differentiate between qualitative and quantitative approach as some research methods can be used for both methods; e.g. interviews; as the interview transcript, can be an examined in both ways. However, in research studies there are no limits on choosing one particular approach therefore researchers are free to combine in order to optimise research findings. The use of a combination of approaches is also known as 'triangulation'; this was defined by One valuable way of triangulating data within the construction industry for example, is by using semi-structured interviews. Saunders (2003) believes that semi-structured interviews enhances the validity of data as it ensures the information obtained follows some sort of structure but also allows freedom to participants to address any concerns they may have or share what they think is important. Summarised triangulation as crosschecking data for consistency and validity.

The multi-method approach is very beneficial because both methods complement each other rather than competing and ensure that the advantages of both approaches are enhances and the weaknesses are minimised.

3.4 Data collection methods

In order to meet research objectives, the method to collect data is imperative. There are many ways to collect data; such as interviews, questionnaires, observations or past literature. These methods can be used individually in a research or combined. Generally, Figure 3.1 shows the method this research implements in collecting data.
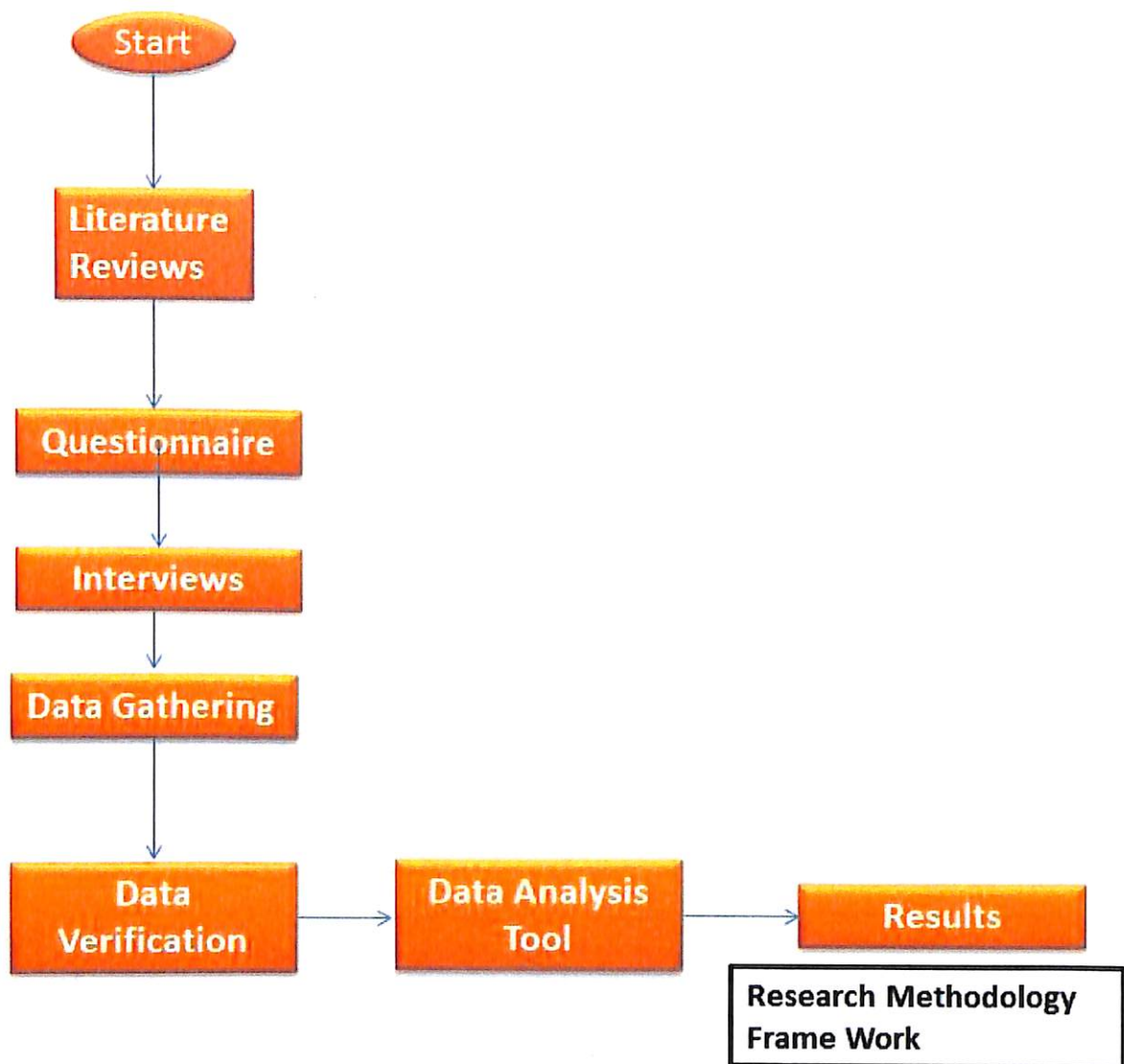

Figure 3 Data collection method

All data collection methods can be divided in to two main types; primary or secondary data collection. Primary data collection is when the researchers collect data first hand through observation, interviews or questionnaires. Whereas, secondary data collection looks at previous resources, secondary data can be further divided into documentary data; which includes books, journals, reports and internet.

Both ways of collecting data can be used in qualitative and quantitative research. Quantitative research will collect data from predetermined tools; such as questionnaires in order to generate statistical data, whilst qualitative research will look closely on words used in the interview. It is strongly recommended for a research to use both secondary and primary data and combine qualitative and quantitative methods (Malhotra and Birks 2003). Hence, in this research, both primary and secondary data collection methods were used.

3.5 The Research Questionnaire

A questionnaire can be defined as: "a pre-formulated written set of questions to which respondents record their answers". A questionnaire is very useful as it allows data to be collected from a large sample prior to analysis. In this Section explains that there are many different types of questionnaire designs; the design chosen depends on how it will be distributed and the time that the researcher is in contact with respondents. Questionnaire designs can be divided into two main types; self-administered questionnaires and interviewer administered questionnaires. Self-administered questionnaires are completed by respondents; the questionnaire can be returned to the researcher via email, the questionnaire may be posted to the respondent and the respondents send it back to the researcher once completed (this is more outdated), it could be hand delivered to each respondent and collected later or, nowadays, questionnaires are posted online and once respondents submit their answers the researcher can instantly see the response. An interviewer administered questionnaire is based on a structural interview where respondents need to answer predetermined questions. Choosing which style of questionnaire to have in a research depends on numerous factors; such as characteristics of respondents, size of sample and required response rate. The main advantages of using a questionnaire is that it is a very versatile method, its low cost for both the researcher and subjects, it is not necessary for the researcher to be highly skilled or trained, the data obtained can be analysed using advanced statistical analysis, it also allows for easy comparisons to be made. However, the weakness of questionnaires is that they require some expertise in the design, conduct and interpretation.

3.5.1 Objectives of the questionnaire

The main purpose of the questionnaire is to obtain as much information as possible in order to gain a relative idea on the topics and to determine the risk factors that influence procurement operations within a supply chain.

3.6 Pilot Research

Once the content of the questionnaire was developed and finalised, a pilot research was performed. A pilot research is done initially in order to minimise questionnaire errors, reduce respondent confusion on some questions and minimise any misunderstanding or ambiguous questions. The pilot research also clarifies the processes that should be used to conduct the questionnaire in order to increase the accuracy of data analysis, questionnaire validity and reliability.

Pilot studies enable researchers to refine data collection plans and allows them to plan ahead in terms of the content of data and procedures to follow. The pilot is a chance for the researcher to see if the research questions and objectives are adequately covered by the questions. It also assesses whether the length of the questionnaire is adequate, instructions are clearly written and easily understood and the layout of the questionnaire is clear. Pilot studies reveal potential gaps or problems in the questionnaire and it is a vital stage in increasing the questionnaires reliability and validity by reducing potential variations causes by errors in interpretation.

3.6.1 Purpose of the Pilot Research

The main aim of the pilot research was to test the questionnaire and find and resolve any serious flaws in the design. It was also used to validate questions to ensure all questions were relevant and did not go off topic, and to check that respondents understand the questions well. The pilot research also provided information on the response rate and helped the researcher develop and test the competency of the questionnaire, design a research procedure, assess whether the research procedure is workable and determine the sample size and collect preliminary data.

3.7 Validity and Reliability

The validity and reliability of all research tools heavily impact a research. Therefore, it is essential to evaluate the accuracy and precision of a research. Validity can be defined as 'whether the research process measures what the researcher intends it to measure'. Whilst reliability can be defined as 'how well a measurement repeated by other researchers at different times and in different places can provide the same results and observations (Saunders et al. 2003). By adopting a multi-method approach, this research already had high validity and reliability, and by using two different types of data collection methods (self-administered questionnaires and semi-structured interviews) this increased the reliability and validity of the research. Finally, by conducting a pilot research, the reliability and validity were further enhanced. The researcher also tried to engage participants in an informal discussion when gathering the questionnaires. The method for distribution of the questionnaires also reduces errors, misunderstanding and ambiguity.

3.8 Summary

This chapter provide the overall research design of this research and explain methods to be applied to each phase. Research philosophy been discussed, approach, strategy and methodology. It illustrates and justify the mixed data collection methods. This chapter also explain the sampling process, developing questionnaire, interview administration, and pilot research and finally the validation and reliability of the questionnaire. The following chapter (4) will present the results and analysis.

CHAPTER 4

Questionnaire Survey Data Analysis and Results

4.1 Introduction

This chapter demonstrate the analysis and results of the research. The data is presented in form of tables and figures. Presentation and explanation of the results has been organised and controlled in harmony with the research objectives. This chapter intends to address the main research questions in investigating the risk areas in procurement materials for oil industries. The main findings of this research will support procurement and operational managers to examine its current situation in terms of identify and mitigate risks that are associated with materials procurement within oil industry. Additionally, the results of this research might be of interest to procurement managers who are practicing materials procurement operations and intend to secure and add value to their procurement process. Furthermore, the findings of this research will contribute in developing Procurement Risk Management Framework (PRMF) dedicated to oil industries.

4.2 Questionnaire Data Analysis

This part will present the results achieved from questionnaire data analysis that has been collected from the result of questioning of materials procurement managers been invited within the oil industry. The results were grouped into different sections includes company general information, company and respondent, risk management, risk identification, risk analysis, risk mitigation, risk monitoring, control and continuous improvement, risk performance, advantage of outsourcing, benefits of using risk management, risks often occur during procurement processes, risks usually occur during procurement implementation and issues are drivers of supply chain risk management in the company. The sections also have sub sections representing data that comprises the answers to the proposed research questions.

4.2.1 Company General Information

This part is dedicated to obtain general information related to the companies. Two main questions were considered, and these were; the type of organization, size of organization and the country in which the organization is operating from. Information obtained from responses can be used later for further statistical analysis.

4.2.1.1 What kind of organization are you currently working for?

The respondents to the questionnaire were asked to provide information on the best description of their organization; service provider/ contractor, material supplier and owner/ end user (Table 4.1). The result is represented graphically by Fig. 4.1. As it can be seen, 19 of these managers who

responded to the questionnaire are material suppliers' managers with 29.2%, 38 managers as service provider/contractor with 58.5%, and 36 managers from owner/ end user with 55.4%.

Type of organisation	Percentage
Contractor/ service provider	58.5%
Material Supplier	29.2%
Owner/ end user	55.4%
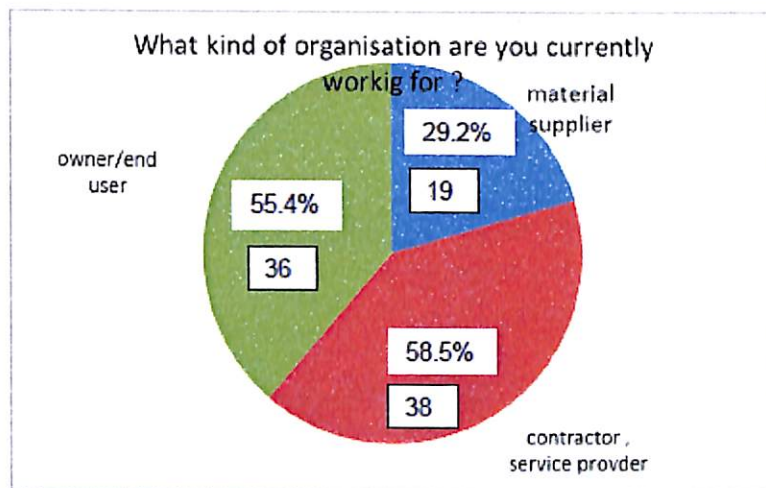
Figure 4.1 Frequency distribution for types of organization

4.2.1.2 How would you classify your organization in terms of size?

Number of employees may indicate few issues such as company performance.
As it can be seen (Table 4.2), analysis showed that 41.5% of total response has less than 50 employees (the lowest number of employees), while 16.9% has between fifty to two hundred fifty (50-250) employees, and 41.5% has the highest employee number with over 250 employees. This is graphically represented in Figure 4.2.

Classify of organisation Size	Percentage
Less than 50	41.5%
From 50 to 250	16.9%
Higher than 250	41.5%

41.5%   41.5%

16.9%
■ Less than 50   ■ From 50 to 250   ■ Higher than 250
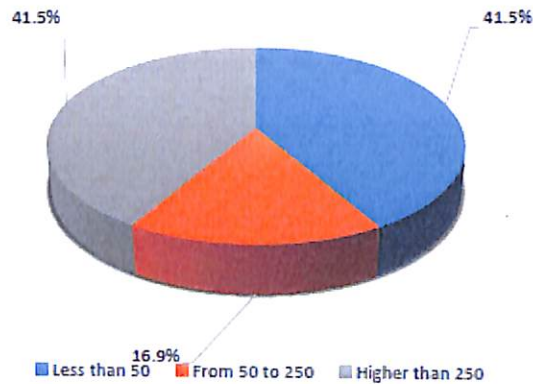
Figure 4.2Frequency distribution of employees' number.

4.2.2 Company and Respondent

In this part, two main questions have been considered, these are; number of years the employees have been practicing procurement operations, value of procurement operation they authorised to execute or normally carry out and whether their company hold ISO certificate.

4.2.2.1 Years of practicing equipment, material procurement and procurement process

The questionnaire respondents were asked about years of experience at material procurement (Table 4.3). The results show that 58.5% of the respondents have 11 to 15 years working experience, 9.2% with 6 to 10 years of experience and 10.8% with less than 5 years. Also, 18.5% have 16 to 20 years of experience while 3.1% have more than 21 years of experience. This is graphically represented in Figure 4.3.

Years have been practicing equipment	Percentage
Less than 5 years	10.8%
From 6 to 10 years	9.2%
From 11 to 15 years	58.5%
From 16 to 20 years	18.5%
Higher than 21 years	3.1%
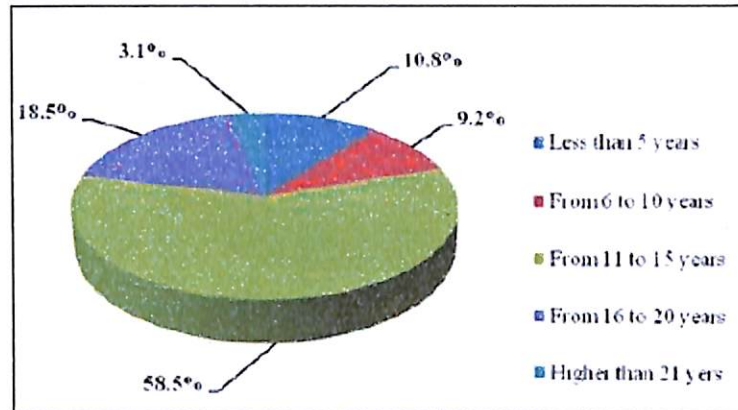
Figure 4. 3: Frequency distribution for years' experience

4.2.2.2 ISO certified

International Standard Organization (ISO 31000) provides generic guidelines for the design, implementation and maintenance of risk management processes throughout an organization. This approach to formalizing risk management practices will facilitate broader adoption by companies who require an enterprise risk management standard that accommodates multiple management systems.

The scope of this approach to risk management is to enable all strategic, management and operational tasks of an organization throughout projects, functions, and processes to be aligned to a common set of risk management objectives.

This question indicates company's standard. The questionnaire respondents were asked about ISO certificate that organizations may hold. The result (table 4.4) shows that 60% of the respondents were ISO certified, 38.5% are not, and 1.5% do not know. This is graphically represented in Figure 4.4.

ISO certified	Percentage
Yes	60.0%
No	38.5%
Do not Know	1.5%
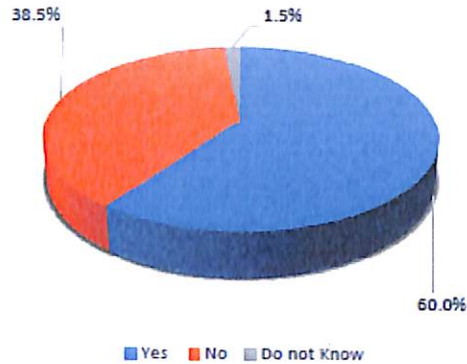
Figure 4. 4: Frequency distribution of ISO certificate

4.2.2.3 Correlation Analysis

Correlation analysis is an inferential statistical method adopted to show how pairs of variables are related. There are different approaches used in correlation analysis, depending on the nature of data. The study examined relationships between independent and dependent variables to determine statistical association. The categorical nature of the data meant that a non-parametric technique was required to determine the level of association and strength of linear relationship between pairs of variables.

4.3 Classify of organization in size and Risk Management.

In order to decide whether the difference between observed and expected values is actually significant and if there is a significant association within classification of organization in size; less than 50 employees, from 50 to 250 employees and higher than 250 employees have been shown in Tables below as independent factor and risks of management, identification registration analysis / assessment mitigation and monitoring & control as dependent factor. In general, statistical association, have been found at 18 of the whole total 35 cases (51.4%), with p-values were less than 0.05.

- Risk Identification

In order to see if there is a significant association within organization size and risk identification; Table 4.5 shows the results. The results show that, the P-values are less than the significance level (0.05), at three of four cases that have been analysed. A significant association have been found between size of organization and risk Identification (0.000), and risk monitoring (0.039). Therefore, it is concluded that risk identification, and risk monitoring are affected by size of organization.

Classify of organisation in size & Risk Management	P-value
Risk Identification	0.000
Risk Analyses/Assessment	0.092
Risk Mitigation	0.307
Risk Monitoring & Control	0.039

TABLE 4.5 Values of the organization size & Risk Management

- Risk Analysis/Assessment

To see if there is a significant association between size of organization and risk analyses/assessment (Table 4.6) shows the results. Moreover, to decide whether the significant difference between observed and expected values is actually. The results show that, the P-values are less than the significance level (0.05), at one of five cases that have been analyzed. A significant association have been found between type of organization and risk analysis/assessment (0.002). Therefore, it is concluded that risk analysis/assessment are affected by the organization size.

Classify of organisation in size & risk analysis/assessment	P-value
Look for the possible sources of supply risks	0.138
Evaluate the probability of supply risks	0.002
Analyse the possible impact of supply risks.	0.205
Evaluate the urgency of our supply risks	0.205
Classify and prioritize our supply risks	0.086

TABLE 4.6 Values of the Chi-squared distribution of organization in size & risk analysis/assessment

- Risk Mitigation

In order to see if there is a significant association within organization in size and risk mitigation, Table 4.7 shows the results. Moreover, to decide whether there is significant difference between observed and expected values. The results show that, the P-values are less than the significance level (0.05), at two of three cases that have been analyzed. A significant association has been found between size of organization and risk mitigation Therefore, it is concluded that risk mitigation is affected by organization size.

Classify of organisation in size & Risk Mitigation	P-value
Demonstrate possible reaction strategies	0.028
Evaluate the effectiveness of reaction strategies	0.000
Supply Risk Management is an important activity in our company	0.326

TABLE 4.7 Values of the Chi-squared distribution of organization size & Risk Mitigation

- Risk Monitoring

To see if there is a significant association within organization size and risk monitoring (Table 4.8) demonstrate the results. Moreover, to decide whether is there significance difference between observed and expected values. The results show that, the P-values are less than the significance level (0.05), at the three cases that have been analyzed. A significant association have been found between organization size & Risk Monitoring. Therefore, it is concluded that Risk Monitoring is affected by organization size.

Classify of organisation in size & Risk Monitoring	P-value
Control our risk management methods in Procurement a	0.082
Control the progress for critical supply risks	0.003
Control our activities for identifying and analysing supply risks	0.040

TABLE 4.8 Values of the Chi-squared distribution of organization in size & Risk Monitoring

- Risk Performance

In order to see if there is a significant association between organization in size and risk performance (Table 4.9) shows the results. The results show that, the P-values are less than the significance level (0.05), at three of four cases that have been analyzed. Significant associations have been found between organization size & Risk Performance. Therefore, it is concluded that risk performance is affected by organization in size.

Classify of organisation in size & Risk Performance	P-value
Our employees are experienced in solving occurrence of supply risks	0.031
Our risk management processes in procurement are very professionally designed	0.014
We managed to minimise the frequency of occurrence of supply risks over the last three years	0.040
managed to minimise the impact of occurrence of supply risks over the last three years	0.221

TABLE 4.9 Values of the Chi-squared distribution of organization in size & Risk Performance

4.4 Main findings of the questionnaire

This study mainly based on questionnaire and semi-structured interviews to achieve the objectives and main aims of the study.

A number of results and findings have been obtained and listed as following:

1. 58.5% of managers who respond to the questionnaire are managers from service provider companies where they are the main focus of this research.

2. 47% of the respondents were operate locally (in Libya).
3. A 41.5% response are having the lowest number of employees (<50),
4. 58% of the respondents have 11 to 15 years working experience, 9.2% with 6-10 years' experience and 10.8% with less than 5 years.
5. 60% of the respondents certify ISO, were 38.5% do not have.
6. The result shows that, P-value is lower than 0.05 (0.041), which indicate that significant differences is exist within the practice of risk management.
7. The result shows that, P-value is lower than 0.05 (0.00), which indicate an existing significant differences within the variables at agreement to the advantage of outsourcing, agreement to the benefits of using risk management, agreement to the risks often occur during procurement processes, agreement to the risks occur during procurement implementation and agreement to the issues is drivers of supply chain risk management in company
8. A significant association have been found between type of organisation and risk analysis/assessment (0.026), and risk monitoring & control (0.028); (Table 4.28). Therefore, it is concluded that risk management and risk monitoring are affected by type of organisation.
9. A significant association have been found in one case between type of organisation and risk identification (0.037) we are constantly searching for short-term risks. Therefore, it is concluded that risk identification is affected by type of organisation

10. A significant association have been found between type of organisation and risk analysis/assessment. Look for the possible sources of supply risks (0.012). Analyse the possible impact of supply risks (0.050). Classify and prioritise our supply risks (0.010). Therefore, it is concluded that risk Analysis/assessment are affected by type of organisation.

11. A significant association have been found between type of organisation and risk mitigation. Therefore, it is concluded that risk mitigation are affected by type of organisation

12. A significant association have been found between type of organisation and risk monitoring (0.048). Therefore, it is concluded that risk monitoring are affected by type of organisation.

13. A significant association have been found between type of organisation and risk performance. Therefore, it is concluded that risk performance is affected by type of organisation.

14. A significant association have been found between size of organisation and risk Identification (0.000), risk registration (0.000) and risk monitoring (0.039). Therefore, it is concluded that risk identification, risk registration and risk monitoring are affected by size of organisation.

15. The results show that, the P-values are higher than the significance level (0.05), at the three cases that have been analysed. Therefore, it is concluded that the risk identification is not affected by size of organisation.

16. A significant association have been found between type of organisation and risk analysis/assessment (0.002). Therefore, it is concluded that risk analysis/assessment are affected by the type of the organisation.

17. A significant association have been found between organisation size & both of risk monitoring and risk performance therefore, it is concluded that risk monitoring and risk performance are affected by organisation size.

18. A significant association have not been found between years practicing procurement equipment & Risk Management, risk identification& risk Monitoring. Therefore, it is concluded that risk management, risk identification& risk Monitoring are not affected by number of years practicing procurement equipment.

18. A significant association have been found between years have been practicing procurement equipment & Risk Analysis/Assessment, risk mitigation & risk performance. Therefore, it is concluded that Risk Analysis/Assessment & risk performance and risk mitigation have been affected by years practicing material procurement.

19. A significant association have been found between the value of procurement projects & risk management, risk identification, risk analysis/assessment, risk Mitigation, risk monitoring and risk performance. Therefore, it is concluded that risk identification, risk

analysis/assessment, risk mitigation, risk monitoring and risk performance are affected by the value of procurement projects.

4.5 *Conclusion*

The results show that, the P-values are higher than the significance level (0.05), at the three cases that have been analysed. Therefore, it is concluded that the risk identification is not affected by size of organisation.

A significant association have been found between type of organisation and risk analysis/assessment (0.002). Therefore, it is concluded that risk analysis/assessment are affected by the type of the organisation.

A significant association have been found between organisation size & both of risk monitoring and risk performance therefore, it is concluded that risk monitoring and risk performance are affected by organisation size.

A significant association have not been found between years practicing procurement equipment & Risk Management, risk identification& risk Monitoring. Therefore, it is concluded that risk management, risk identification& risk Monitoring are not affected by number of years practicing procurement equipment.

CHAPTER 5

Interpretation of Results

5.1 Introduction

This chapter presents the analysis of the qualitative data obtained from in-depth semi-structured interviews designed for the research questions. The rationale for choosing in-depth semi-structured interviews as data collection instrument was presented in the methodology.

5.2 Sampling for case research interview:

The interview began with questions regarding general information of the important risks that interviewees frequently face, and then moved on to questions about the impact of these risks and how they can be reduced. This section is to stimulate the interviewees to think about risks within their operations as well as their reactions. In the second phase of the interview, they were requested to explain the risk management strategies and practices. The third part was dedicated to evaluating the outcome and performance of the procurement team.

End user and service provider companies with large size in terms of number of employees were considered. The size of a company is associated with the extent to which it invests financial and human resources in risk management, which may lead to different approaches to risk management. In consideration of these factors, twelve service provider companies were selected for interview. For the case research interviews, procurement managers in each company were contacted via email/Skype with an invitation letter (Appendices 2-A) enclosing the interview questions and the interview consent form (Appendices 2-B).

Eventually, 9 interviewees from 12 agreed to participate in the interview. All interviewees have minimum work experience of 6 years.

Table 5.1 shows participants with time duration for each interview.

Interview Questions

General Risk Profiles

- What are the challenging risks you most frequently face during the procurement process? Why are they the most important ones?
- Is there any reason why these risks appear frequently?
- What are the impacts, likelihood and predictability of these risks?
- Can these risks be reduced/managed?

Dissertation by: Kapil Kumar
DISSERTATION TOPIC – EVALUATION OF SUPPLY CHAIN RISK MANAGEMENT INVOLVED IN OIL INDUSTRIES.

Determinants of the Strategies

- Do you use any system for documenting incidents i.e. tools, software or contingency plans to monitor or mitigate the consequences of these risks?

Outcome of the Strategies

- Are you satisfied regarding the performance of your procurement team in terms of managing/mitigating risks? Can this performance be increased through training?

No	Participants		Time	Position
1		MN1	30.54	Manager
2		MN2	30.33	Manager
3		MN3	30.58	Manager
4		MN4	30.10	Manager
5		MN5	30.25	Manager
6		MN6	30.50	Manager
7		MN7	30.53	Manager
8		MN8	30.50	Manager
9		MN9	30.55	Manager
Average			30.34	

Table 5. 1: shows the time and position of each Interviewee.

5.3. Analysis of the participants' Interviews

In the qualitative analysis part of this research, Participants analysis was used for data analysis due to its advantages, see Figure 5.1. One of the advantages of using the Spreadsheets. It's facility to decrease the problem of 'drowning in data' by allowing data to be separated into sub-subjects and categories, which provide a simpler structure. The responses of the nine respondents captured through the semi-structured interviews were transcribed, and then the themes were carefully selected and coded. The coded themes with its findings from interviewees were then grouped into different families in tree nodes and graphically presented as networks of relationships (Figure 5.1).

5.4 Interview Findings

This section presents the findings from the interview, revealed the challenges and risk during procurement processes. It also analyses and discusses the outcome of the interview from findings.

5.4.1 Challenging and Risks during procurement

The questions posed to the interviewees were open ended, for example, "What are the challenging risks you most frequently facing during the procurement process? Why they are the most important ones?" Most of the interviewees mention Oil Fluctuation Price, Product Discrepancy, Security, Clone Part, and Delay as the most challenging risks that they frequently face during the procurement process. In case of Clone Part, the majority (89%, 8Nr) mentioned this risk when they responded to this question and they cited why it is the most important one. One of interviewees (Interviewee MN1, and sample of interviewee transcript in Figure 5.1) stated that a clone part is very crucial, because installing clone parts will damage our drilling machines, causing delay in the project management schedule. He provided more explanation for that"…And because the global market contains various levels of quality standards, therefore quality as original parts is our top priority; this is the most challenging risk we frequently face". Interviewee MN2, add the same point to the risks that mentioned in his answer of this questions as he stated: "….Another risk we facing is specifically with our suppliers who by mistake supply unoriginal parts or equipment (clones), this issue can harm our project timetable, hence identifying clone parts is important to prevent such delay". Moreover, interviewees MN8 and MN9 have the same opinion about the clone part which can harm their project timetable, as one of those respondents mentioned that the crucial risk they face is specifically with the suppliers who unintentionally supply unoriginal parts or equipment (clone), this is due to the wide number of manufacturers in the world market with identical specifications to originals. These clone parts cause failure to machines which disturbs project timetables (MN8).
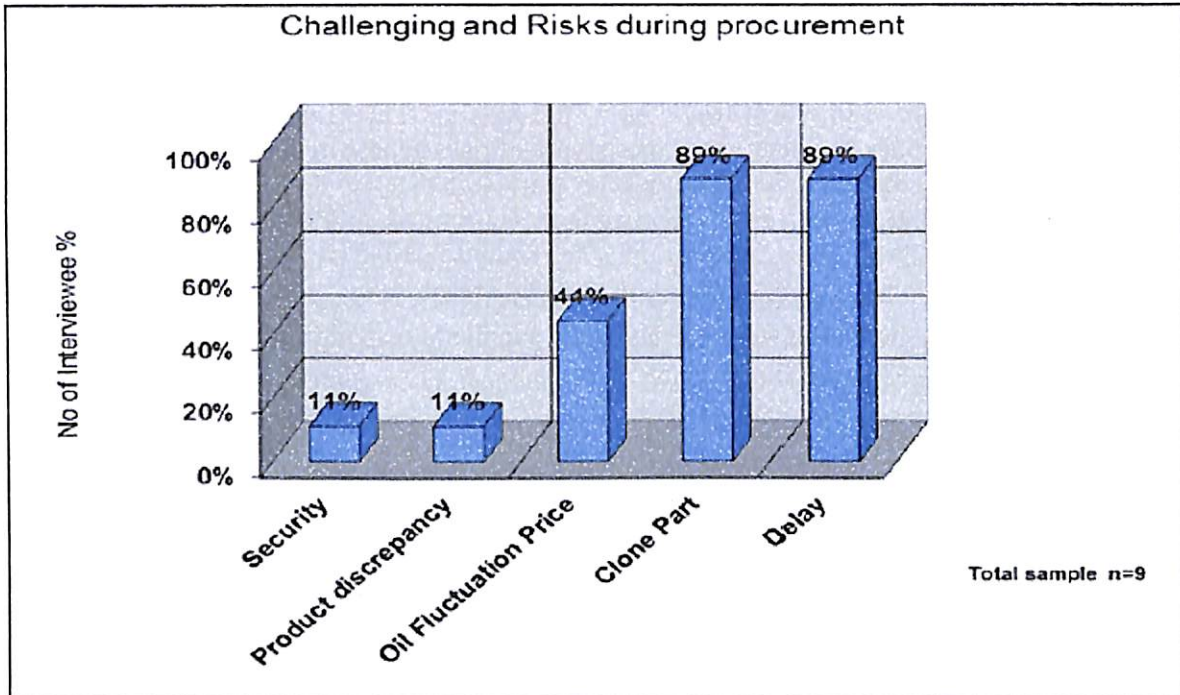
Figure 5. 2: The Challenging and risks found in the interview during procurement.

5.4.2 Reason for risks appear frequently

The question posed to the interviewees from were open ended *"Is there any reason why these risks appear frequently?"*

Most of the interviewee's answers cover the points that are: hard to identify clone, Goods Transhipment, and No control on the oil market price are the reasons why the risks appear frequently. Figure 5.2 shows the percentage of the reasons for risks that appear frequently.

In case of hard to identify clone, the majority of interviewees (78%, 7Nr) consider this risk amongst the most important factor for risks appear frequently.

Interviewee MN1 when he responded to this question said "yes". He said that they receive clone parts more often because it's very hard to identify even for suppliers. He mentioned the need for experience and knowledge to distinguish between clone and original parts.

According to MN3 who assigns that to open market and competition between manufacturers and explain in details the situation as he stated:

"With the open market and competitions between manufacturers, some of them manufacture clone parts which is similar to original ones but with a lower quality and price. These parts are difficult to identify and distinguish them from original ones, and suppliers may intentionally provide them as original parts. For these reasons, clone part problems appear frequently"

Even more, interviewees MN6, MN7, MN8 and MN9 have the same point of view about clone parts which cannot be easily identified even by the supplier. This is due to the similarity of the products to original ones, and that's why these types of risks appear frequently. All of them agree that experience is needed in order to distinguish between clone and original parts. Experience is also needed in the open market, as lots of manufacturers claim they are original parts makers.
In the same context, three interviewees (33%, 3Nr) count that the risk of goods transhipment is one amongst the most risks appears frequently. MN4 and MN5 have the same attitude about it, as they mentioned that the reason for the delay is the supplier's responsibility, and usually because of the transhipment of the goods and changing ports.

Only one respondent (interviewee MN2, 11%, 1Nr) referred to this risk. He mentioned that they have no control on the oil market price and they take these issues as serious in their meetings as indicated:

"Regarding the market fluctuation, we have no control on the oil market price; however, in our proposal to the owner we consider this financial risk by adding margin to the total budget of the project to protect ourselves from this fluctuation."
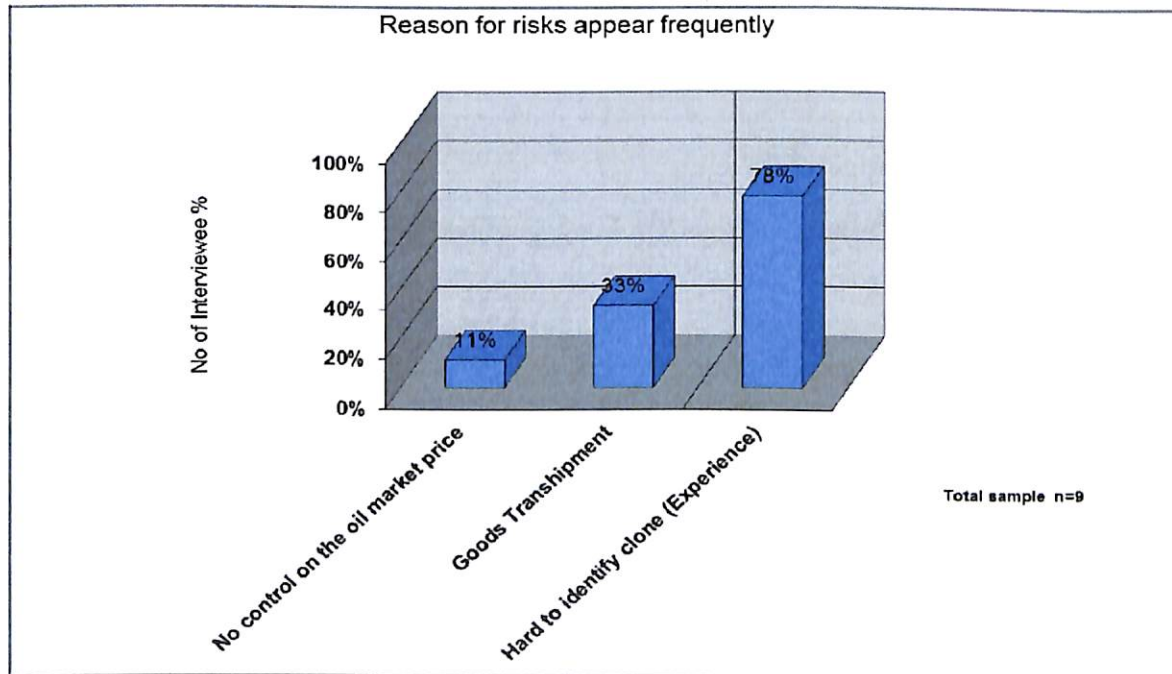

Figure 5. 3 The reasons for risks appear frequently

5.4.3 Impact of the risks

The question posed to the interviewees were open-ended *"What are the impacts of these risks?"*

Most of the interviewee's answers count the points that are Penalties, Problems to the machine, and Cancel projects as the impact points of these risks. Figure 5.5 shows the impact of the risks during the procurement.

The majority of interviewees (67%, 6Nr) cited that Penalties are one of the impact points of these risks, as one interviewee (MN1) mentioned it among other impacts. He refers to the clone parts which cause major problems to the machine that led to project delay and result of that paying penalties to the field owner, he explained that when responding to the question as stated:

"The impact of clone parts is very crucial, because no one can predict when this part will fail causing major problems to the machine, causing project delay and paying penalties to the field owner."

In the same context, another interviewee (MN") had the same opinion as he declared that the delay may cause penalty to be paid to owner and also extra cost on maintenance.

However, interviewees MN4 and MN5 have the same opinion about delay penalties as MN5 indicated that "Delay of receiving parts or equipment can negatively affect the project timetable, and with our company as a service provider, we have to finish the job according to the contract being agreed with the owner, otherwise a heavy penalty should be paid by our company".

Moreover, interviewee MN8 pointed out Security and Clone parts as they should take priority in this issue:

"Security and clone parts should be in highest priority as it can disrupt project time table, hence paying delay penalty to owner which obviously harms our reputation and record as a service provider."

Another impact of risks as mentioned by many respondents (67%, 6Nr) is Problems to the machine, as interviewee MN4 talked about Procurement of unoriginal parts and how it impacts the machine: "Procurement of unoriginal parts or clone parts can cause crucial loss. If these parts

are installed to a machine, this machine can be defected any time by this clone part causing general failure to the machine and stopping it from completing the job".

In the same manner, interviewee MN7 agrees with interviewee MN9 about the risks that affect the machines and have the same opinion in this subject, as he stated:

"The impact of clone parts is crucial, because no one can predict when this part will fail causing major problem to the machine causing project delay and paying penalties to the field owner."

Interviewee MN2 has the same attitude as he stressed that it is a crucial problem, especially regarding cloning unoriginal parts. He adds "…Clone parts can harm equipment during operation causing project delay."

In this context only previous mentioned interviewee (MN2) warned from cancelation of the projects because of the instability of oil price, as he stated:

"Oil price fluctuation may force the owner to reduce or even cancel their projects; this will limit our business opportunities with this owner."
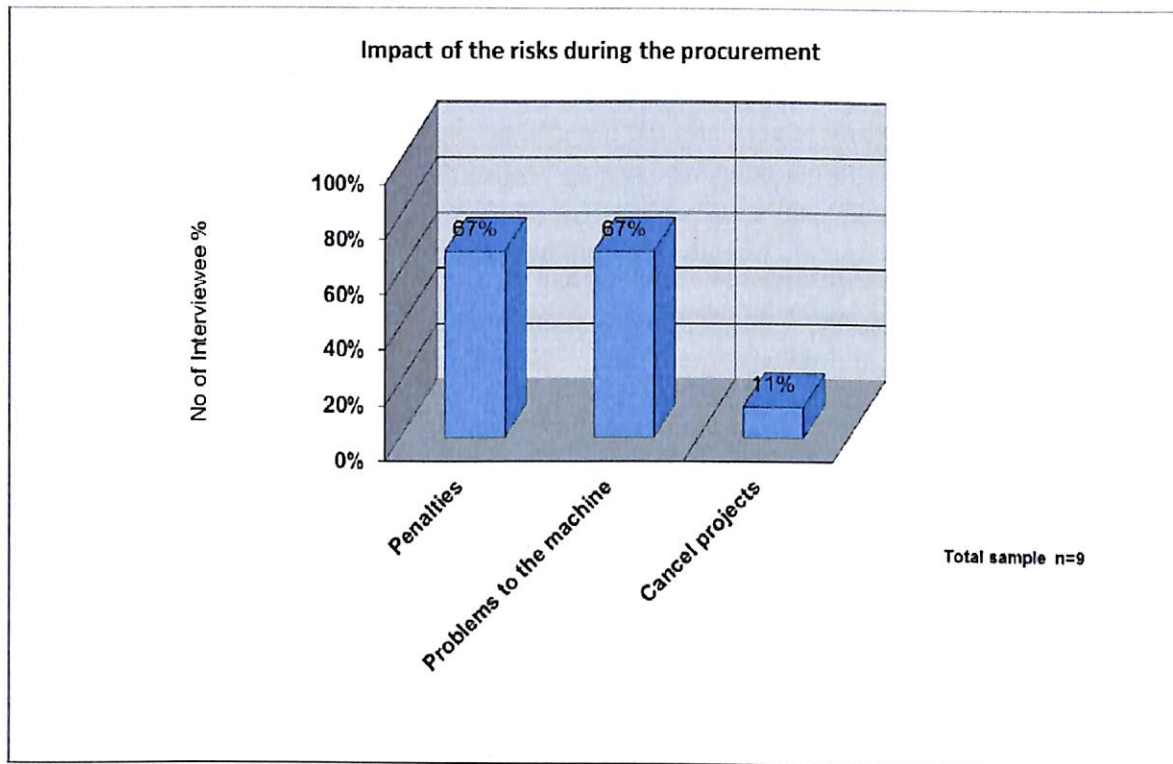

Figure 5. 4: impact of the risks during the procurement

5.4.4 Monitoring system

The question posed to the interviewees from were open ended *"Do you use any system for documenting incidents, tools, software or contingency plans to monitor or mitigate the consequences of these risks?"*

All the respondents answer that they use any system for documenting incidents, tools, software or contingency plans to monitor or mitigate the consequences of these risks. In their answers consider three main methods to which is Procurement guide book, Follow manufactures product, and Record for supplier's performance (Form). Figure 5.6 shows percentage of this ways to monitoring the risks

All interviewees (100%, 9Nr) declare that they have use record for supplier's performance (Form). In this regards, interviewees MN4 and MN5 have the same attitude about this issues as MN5 said Yes they have a monitoring system for risks they faces:

"Yes, we keep records for all suppliers we deal with in a database to evaluate and classify suppliers based on their reliability and performance."

Moreover, interviewee MN3 stated from his point of view that his company works with forms to evaluate and classify suppliers:

"In our company, we use forms that evaluate our suppliers; we classify them as class A, B, or C in order of reliability. These forms help us in evaluating reliable suppliers based on their previous records."

In the same manner, four interviewees (interviewee MN1, interviewee MN7, interviewee MN8, and interviewee MN9) have same beliefs, as they declared that they monitor and record the supplier's performances then rank their reliability accordingly.

In regards to follow manufacturer's product, this technique for monitoring or mitigating the consequences of these risks that are being faced was mentioned by four interviewees (44%, 4Nr), as all agree that they encourage the procurement team to follow manufacturer's products and updates. In this context, only one interviewee (MN2, 11%, 1Nr) has the same attitude that they use previous procurement data projects to indicate incidents especially with supplier's performance in order to re-evaluate their reliability and proficiency. He adds that they use a special book "…We also use procurement guide book."
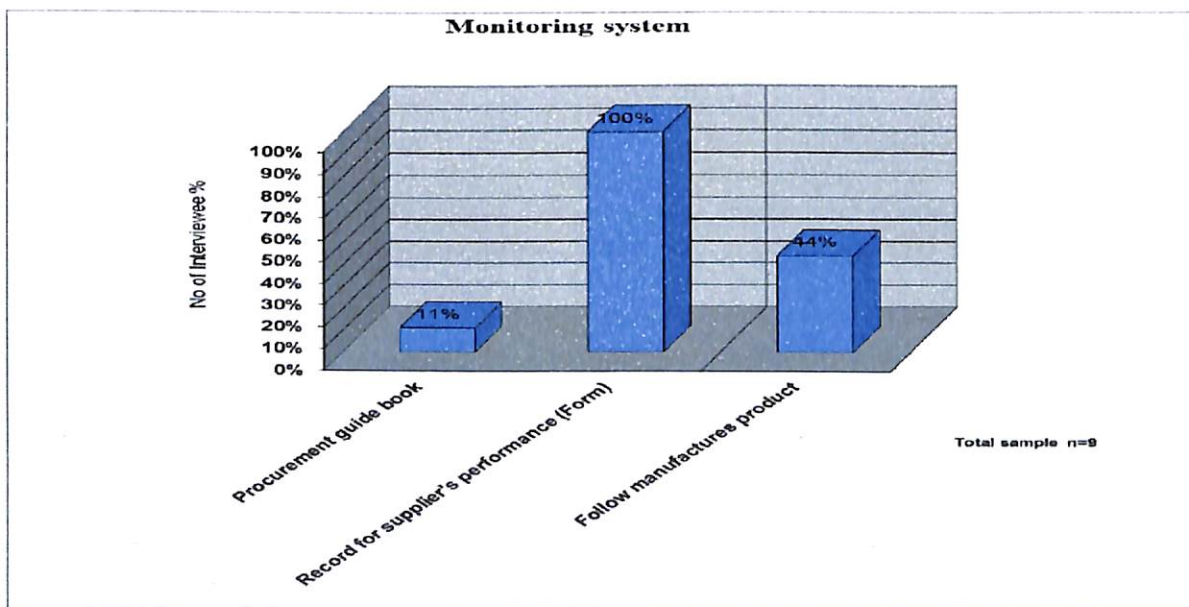

Figure 5. 5 the way to monitoring the risks

5.4.5 Satisfaction on procurement's team and increase performance

The questions posed to the interviewees were open-ended "Are you satisfied regarding the performance of your procurement team in terms of managing/mitigating risks? Can this performance be increased (i.e. Training?)"

All answers of interviewees were satisfied on performance of procurement teams, but all of them suggested different methods on how they increase performance. Some of which include: Planning, Communication and Cooperation, Analysis of data, Experience, and Training (Figure 5.5).

The majority (78%, 7Nr) consider training as the most important tool to increase performance of the procurement team.

In this theme, interviewee MN3 answer was satisfied about the performance of his company's procurement team and their plan mitigate the consequences of facing any risk, and he suggests more training to increase this performance:

"Yes, I am satisfied about our team performance. They always plan to mitigate the consequences of any risk that might affect our job. Continuous training with experience will increase our ability to manage and mitigate our risks."

Interviewee MN1 included training amongst other mentioned points he stated

"There is always room for increasing the performance in risk management by providing constant training, continuous communication and cooperation with suppliers, analysing records and data. All these procedures will help predict potential risks and enhance the performance of our team".

Interviewees MN7, MN8, and MN9 have the same opinion as MN1 which is that the provision of constant training will help predict potential risks and enhance the performance of the procurement team.

Moreover, interviewee MN5 mentioned that their records show significant progress has been achieved by the team. This achievement is due to experience, continuous training and good planning.

Even more, interviewee MN6 explains the situation in the company in the last two years, as the number of risks decreased. He also provided the percentage for, as he referred to training programs which reflect performance of staff:

"During the last 2 years, it's been noticed that the number of risks has dropped by 30%. This improvement is due to the experience and training programs our staff participated in, and I believe there is still room for further improvements."
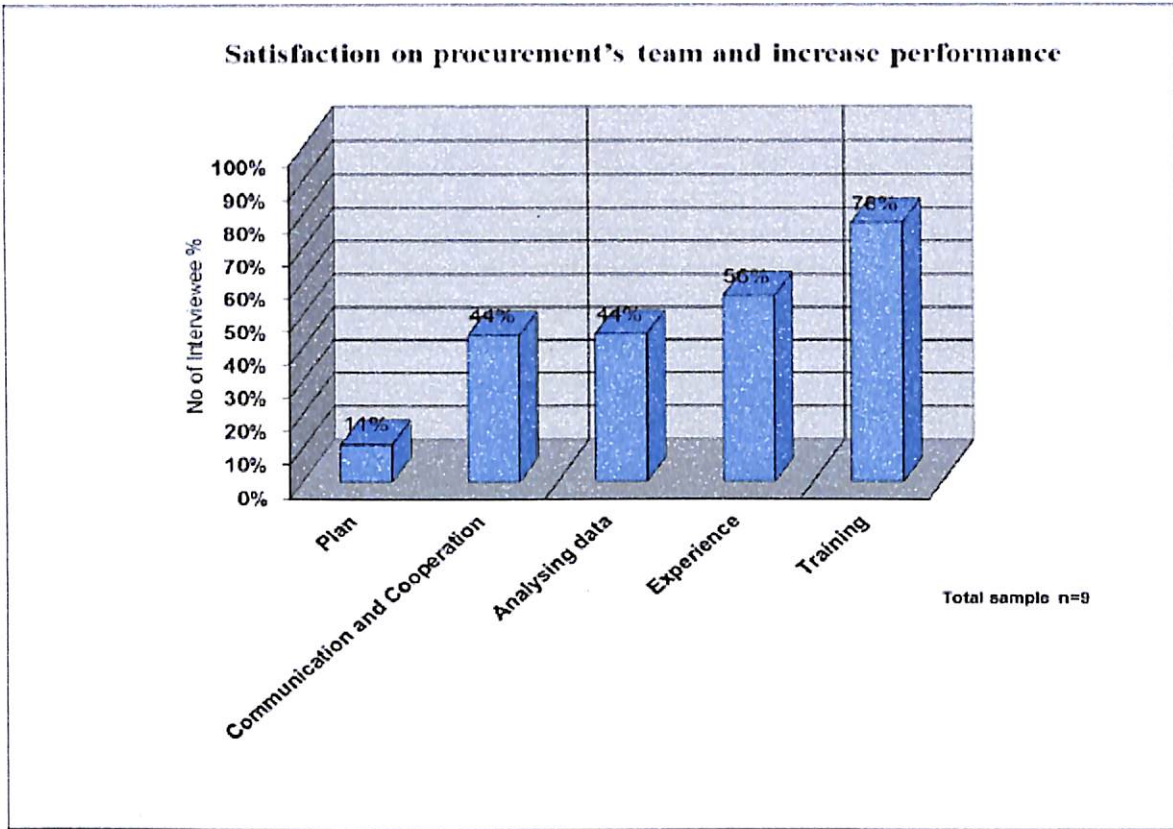
Figure 5. 6 Different ways of team performance

5.5 Summary

This chapter presented results of the data collected through the field research, using semi-structured interviews which were classified They were then analysed using content analysis (developed analysis). The findings in this chapter were covered in detail. The subjects, themes and sub-themes of challenges and risks during procurement frequently appear. Reasons for risks appear frequently. Impacts of the risks, how to reduce and manage the risks, monitoring available systems, satisfaction of procurement teams and how to increase performance also appear.

CHAPTER 6

Conclusion & Scope of Future Work

6.1 Research Summary

This section is a recap of this study's contributions which was embarked upon to answer the research questions and deliver the stated objectives.

The approach incorporated the two methodologies, quantitative and qualitative to address knowledge gaps and produce experimental research. This study not only investigates the current practice of material procurement risk management among oil companies, but also proposed a tool (framework) that will support the initiative, if it is implemented, to support material procurement activities in Oil Ind. In addition, the validated knowledge will enhance risk management awareness activities in this Company, especially for the oil industry. The concept of Risk Management (RM) is identified as a way of mitigating the challenges faced by procurement managers affected by risk factors. Therefore, RM has been applied to supply chain management (SCM) activities in relation to activities involved in procurement processes.

6.2 Originality of the Research

The essence of this study is to provide a significant addition to existing knowledge in research which should be based on idea or concept novelty. We established the different variations to research in terms of originality.That is, creating or inventing new knowledge. This study, therefore, is believed to have met the criteria of study uniqueness, capability, and knowledge contribution as presented in Table 6.1.

Dissertation by: Kapil Kumar
DISSERTATION TOPIC – EVALUATION OF SUPPLY CHAIN RISK MANAGEMENT INVOLVED IN OIL INDUSTRIES.

Criteria for Research Originality	Evidence in thesis
Evidence of key study	o Evaluation of risk management among procurement managers in Libya.
Source for quality data	o Questionnaires and interviews with procurement executives. (NOC)
Use of data	o Triangulation methodology was implemented in the research, as combination of quantitative and qualitative methods to strengthen the direction of research
Embarking on new experimental study (Innovative results)	o An empirical study on Libyan oil companies as a potential risk group for the procurement process. o PRM Framework
Ability to significantly utilise available idea and resources	o References on SCRM and procurement perspectives
Setting down a major piece of new information.	o Expose risk supply and procurement knowledge among the Libyan companies that are practising procurement processes. o Help in the prediction of supply risk factors through inferential statistic (Chi-Square test).
Publication	o 2 Abstracts have been accepted by conferences. o One Journal paper is published & one is in progress.
Being cross-disciplinary (Engineering concept and procurement risk management)	o This thesis is representing engineering concept and procurement risk management.
Making a unique combination (Innovative by-Risk management.	o Produce empirical study on Libyan oil companies for potential risk during the material procurement process. o Develop and validate PRM Framework

Table 6. 1: Summary of Research Originality

6.3 Objectives Accomplished

The contribution presented in this study is the application of risk management knowledge to the developed framework to enhance procurement process activities in Oil Industries. To accomplish the success of the integrated concept proposed in this research, a comprehensive analysis and evaluation of procurement risk factors were presented for both academic and industrial justification. The study effectively presents a procurement risk management-based framework which is validated to provide answers to the research questions and other issues related to material supply issues in a Company.

The research attempted to achieve the objectives highlighted in chapter 1 as listed:

- Reassessed the whole global initiatives of the supply chain and supply chain risk management (SCRM).
- Explored and identified the various risks that propagate within the material supply chain in the oil industry by using questionnaire and interviews.
- Investigated the risk management strategies that oil companies currently practice that are related to material procurement process within the oil industry.
- Produced a validated framework on risk management process.

6.4 Contributions to Knowledge

The current research study has contributed to knowledge regarding the following;

• A comprehensive analysis of the existing risk management strategies practice presented in chapter 4, 5, and 6 above.

• The findings acknowledged the procurement management problems in oil industry.

• The quantitative data obtained through questionnaire and presented in chapter 4 provides information relating to practice consciousness of risk management strategies and risk factors on procurement process in the oil industry.

• The data in chapter 4 has been enhanced in chapter 5 which demonstrates the qualitative data acquired through semi-structure interviews. Findings in this process show the extent of risk occurrence during the procurement process.

• The research entirely has proposed an information management system framework capable of improving procurement process activities. These activities aim to monitor and mitigate the challenges and risk rate through the use of a knowledge-based initiative (framework).

6.5 Research questions and findings

The main aim of this study is to examine the risk management strategies for material procurement to achieve a robust procurement process in oil industry. In order to meet the target, the research was approached through the following means:

(1) Identified and analysed various risks in material procurement operations.
(2) Examined the risk strategies for managing these risks
(3) In relations with organisational orientations.

The research adopted a multi-phase mixed method study incorporating two interconnected phases of research. The first phases included the exploratory and analytic study that used questionnaire and interviews. This phase was aimed at the profiling of material procurement and supply risks within the oil industry, (Chapter 4 and 5).

(1) The second phase was also an exploratory study but adopted literature review for the framework development of risk management strategies in order to mitigate material procurement risks and to propose hypotheses regarding the relationships between two risk management strategies and their desired performance outcomes.

From the literature review in Chapter 2, several research gaps were identified such as:

• In the application of supply chain risks and material procurement risk, where international supply process is more complex than domestic.

• The need for systematic risk analysis because existing risk identification and analysis has tended to provide independent risk concepts without considering interconnectedness and interconnections of risk factors.

• The risk management at a strategic level in consideration of empirical evidence.

• The business contexts were affecting the implementation of risk management strategies.

• The consequences of risk management strategies.

The research questions of this study were developed to address these research gaps, which are as follows:

Q.1 What are the risk areas to be managed in materials procurement process for oil industry?
Q.2 What are the main risk management strategies to be considered?
Q.3 Can these strategies generate positive performance and outcomes?
Q.4 How can procurement managers effectively manage risks in supply and procurement process?

6.6 Research Implications & Limitations

A successful implementation of the two phases of risk management strategies provided for material procurement operations implies the means of determining and identifying risks in materials procurement and for the company to effectively mitigate these risks. The research implications are further towards managerial, methodological and theoretical.

6.6.1. Theoretical implications

Theoretical implications for this study can be summarised into six points:

• This research is the first study which has applied four risk management strategies to material procurement. Although there have been studies on supply risk management, their research scope was constrained to a specific mode or a certain phase of risk management, thus lacking a holistic view of risk management. This research highlighted risks amplified by information and relationship issues, as well as, illuminating the importance and risk mitigating measures. Also, some unique risks specific to oil material procurement were explored and prioritised by this research.

• This study explores how the consideration of risk management can reshape supply chain management.

• A framework for risk management strategies was suggested based on information processing theory (Galbraith 1963), a rigorous literature review and empirical validation. This framework comprises of two dimensions, namely the treatment of information

processing gap and intra-/inter-organisational strategies, which can effectively respond to risks arising from the failure in information and relationships.

The framework was created in the context of material procurement risk management but can also apply to supply chain risk management. In these circumstances, risk management strategies, in this research, expanded discussions on supply chain risk management strategies (Bode et al. 2011) and global supply chain risk management strategies.

- Several mechanisms behind the implementation of risk management strategies. The effects on risk management strategy are now empirically validated by a large-scale questionnaire and interview. The findings can be a stepping stone for further research because they suggest corporate features and cultures that a firm need to possess for risk management.
- The results can be applicable to the better understanding of SCM and SCRM.

Many SCM literature emphasised the importance of information and relationships in supply chains but did not have empirical grounds to support the idea in risk management views. This study revealed the crucial roles of information and relationships in risk management, thus will provide theoretical reinforcement for SCRM, supply chain collaboration and supply chain integration. Also, the relationships between organisations and risk management strategies may become the grounds for future research. The constructs used in this research can be easily transformed into SCRM, which can foster empirical research based on the larger-scale questionnaire.

6.6.2 Methodological implications

Three methodological implications are listed as follows:

1. This work combined empirical and analytical research techniques to capture the real shape of material procurement risks. The creative combination of the qualitative and quantitative mixed method maximised the explanation power of the proposed risk structure because it analysed the empirically-driven elements in a systematic manner. It is different from previous research which used elements from the literature review. The findings have graphically and systematically demonstrated the interactions of risks, which can provide empirical evidence to the concept of the risks within material procurement process.

2. The qualitative data analysis (QDA) to investigate the type of risks most frequent within procurement process and ranked it depending on their severity. It has not been used very often in SCRM research which was mainly led by qualitative studies. This research can guide for future research which will use this technique in the context of risk management.

3. This research covered all risk management phases using a multi-phase research method. It showed the applications of both qualitative and quantitative research methods within positivism paradigm by merging advantages that each method owns. In particular, the linkages between different methods were clearly suggested to figure out a holistic risk management approach. Managers can follow the series of research methods proposed in this research to find out critical risks in their organisations' procurement operations, the current status of their risk management practices and the future directions for mitigating critical risks.

6.6.3 Managerial implications

Managerial implications can also be drawn from this study as follow:

- The profile of material procurement risks will enable managers to anticipate and proactively deal with potential risks. The risks mentioned in this research are not completely exhaustive but still very meaningful because they are explored by practitioners from specific industry involved in material procurement. Although material procurement process might be a small portion of the entire supply chain, its importance cannot be underestimated because material procurement operations are often the weakest link in the supply chain due to lack of information and control.

- Risk sources such as outsourcing and number of risk factors can provide a guideline to managers in investigating risks of their daily procurement operations. With individual or collective efforts, they can explore risk factors residing in each category. In this way, they can reach the root causes of their current and future disruptions, which can be the foundation of their risk management.

- This study highlighted the importance of the relationships with trade partners and procurement service providers because they play a great role not just in amplifying procurement risks but also in monitoring and mitigate it.

- In particular, to develop collaboration are highlighted as the primary risk management strategies. Managers can investigate their definition of relationships reflecting the risk management practices proposed in this study, and thus achieve positive risk management performance.

- Companies involved in material procurement can evaluate the current status of their risk management efforts with the risk management strategies and practices suggested in this study, and then benchmark some of them. The four strategies (Building a stable procurement process, leveraging procurement information, leveraging outsourcing contracts and developing procurement collaboration) will provide practical ideas as to how companies can reduce risks. It will also be important for companies to reach a compromise on their direction of risk management with their trade and procurement partners.

- The research suggests that companies should carefully consider risk management strategies because their effects on risk management vary slightly. In general, the strategies to build a stable procurement process and to develop procurement collaboration are effective to fulfil robustness.

- Organisational orientations were emphasised in this research to enhance risk management strategies leading to risk management capabilities. Customer focus and awareness is a good starting point for a firm to consider possible risk areas and their consequences in the procurement process. From the customer's point of view, companies can easily detect risks undermining their operations and have strong rationale to rectify the issues despite the needs for financial investment and top management's supports.

Companies striving for risk management culture can implant these orientations first to achieve effective material procurement both in operational performance and in risk management performance.

6.7 Limitations and Recommendations Future Research

The limitations of this study will open opportunities for future research relating to risk management.

- As the proposed framework is designed to be used as a template, the process of risk identification, monitoring and analysis can be imitated in other supply chain applications, such as warehousing or procurement in other industries. Since this study focused only on oil materials procurement out of a variety of applications in supply chain management, the findings may be very specific to the oil contexts. The application of the same research process to other areas will broaden the knowledge on supply chain risk management.

- The variation in the construction of focus groups may result in more rich knowledge. This study started with a number of stakeholders, then focus on service providers group without mixing up the participants. Mixed group, however, may facilitate further discussions about risk factors which the same group of people may overlook because they just take them for granted.

- Moreover, although this study invited participants from service providers and end-users, other participants in the supply chain, such as logistics service providers, terminal operators and customs may also be invited to future research to provide a more comprehensive picture of material procurement risks.

- Cross-validation of the structural framework can be possible by widening the geographical scope of the research. This study investigated risk management by companies in Libya. Even though Libyan companies are a good sample to test the framework when their volume of material trade and procurement is considered, cross- validation of the framework by other geographical areas will determine the general application of the research framework and findings. In particular, a comparative analysis between countries with small and large material trade volume will provide fresh insight into the development of risk management initiatives.

Lastly, future research may consider risk analysis using Agent-Based Modelling and Simulation (ABMS) to analyses the behavior of procurement stakeholders, risk management strategies and risk level to confirm the positive effects of risk management on risk management performance.

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APPENDIX

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Data Collection- *the Data Collected through interview and questioners conducted among the Managers of purchase, Logistics, warehouse & Others Who are Involved in Complete Supply Chain Management.*

Data collection method

- *Questioner*
- *History of old Research*
- *Survey analysis*

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Subject:- Willingness for Guiding Dissertation of Kapil Kumar Registration No.500064151.

Dear Sir,

Kapil Kumar is registered for MBA- LSCM, with the University of Petroleum & Energy Studies, Dehradun in 2017-2019 batch.

I hereby give my acceptance to guide the above student through the Dissertation work 'EVALUATING RISK INVOLVED IN SUPPLY CHAIN MANAGEMENT', which is a mandatory requirement for the award of EMBA degree.

Thanking You

Yours Sincerely

29/Nov/19

UPES
CENTRE FOR CONTINUING EDUCATION

DISSERTATION For the Degree of <u>MBA in Logistics & Supply chain</u>
<u>Management</u>

DISSERTATION TOPIC
EVALUATION OF SUPPLY CHAIN RISK MANAGEMENT INVOLVED IN OIL INDUSTRIES

Submitted by: Supervised by:

KAPIL KUMAR   **Mr. MANISH KUMAR**

Academic Year: 2017- 2019

CONTENTS

EXECUTIVE SUMMARY:

CHAPTER 1 : Introduction

CHAPTER 2 : Literature Review

CHAPTER 3 : Research Design, Methodology & Plan

CHAPTER 4 : Findings & Analysis

CHAPTER 5 : Interpretation of Results

CHAPTER 6 : Conclusion & Scope of Future Work

- # EXECUTIVE SUMMARY

- Report focuses on the Supply Chain Risk management involved in Oil Industries. In this we will analysis the root causes which are affecting the Complete SCM Process.

- At First we will review the Procurement management, its importance and risk management in term of Survey and Analysis .The reports will contain the Methods & tools generally using for the Solution.

- # <u>INTRODUCTION</u>

- Supply- chain management (SCM) can be defined as the configuration, coordination and continuous improvement of a sequentially organized set of operations. The goal of supply- chain management is to provide maximum customer service at the lowest cost possible.

- The goal of the Study is to maximize profits to the firm, The same must maximize benefits and minimize costs along with the Good supply-chain.

- Risk Management Can Controlled by Such Drivers: Outsourcing, Integrated manufacturing, Efficiency, Reduce improper suppliers , Labour strike, fire, terrorist attack and natural disasters

- ## Literature Review

A) **Business Planning and Project Strategy:** In this phase, the decision to start exploring the feasibility of developing a project is made. Reasons to start a project could be a future lack of capacity in a certain installation or the indication of a producible oil field.

B) **Front End Development (FED):** The main goal of FED is to provide the owner with a sufficiently complete image of the project to enable them to decide whether the project is worth investing resources. In the oil industry, it is a common practice to divide the front-end development phase into three stages, FED 1, 2 and 3. These represent assessment, selection and definition of the project respectively .

C) **Implementation and Operational Readiness:** In this phase, the main engineering operation (construction, drilling, etc.) takes place.

- ## Literature Review

D) Supply Chain Risk (SCR): Risk is usually Associated with other terms such as the unknown, unpredictability and uncertainty. It can brief as the likelihood and impact of unexpected macro and/or micro level events or conditions that adversely influence any part of a supply chain leading to operational, tactical, or strategic level failures or irregularities.

E) Risk Mitigation: This section discusses the classifications of risk mitigation methods such as demand risk mitigation, macro risk mitigation, supply chain, manufacturing, financial, transportation, information & general risk mitigation methods.

- **Literature Review**

- **F) SCRM Procedure:** Five major steps involved in SCRM approaches are identified. They are: Supply chain risk analysis , Risk types and factors identifications, Assessment of probability of occurrence and overall impact, Selection and implementation of risk mitigation strategies, Continuous improvements.
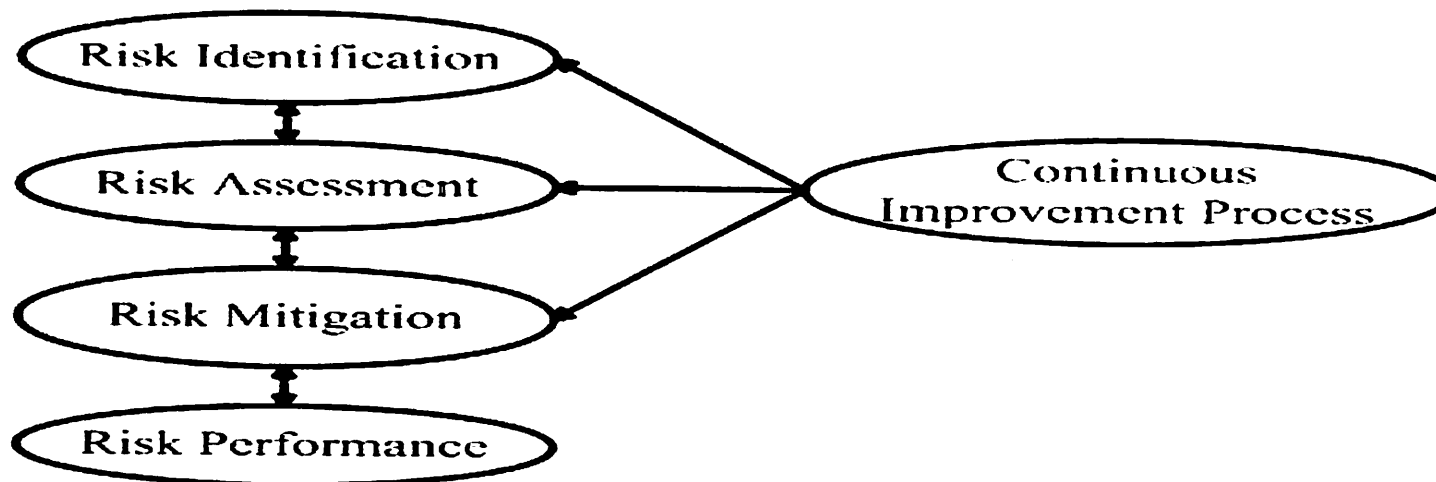
- ## Research Design, Methodology & Plan

- ## Research Philosophy: Research philosophy refers to the way the researcher reflects on the development of Knowledge. Two main research philosophies- Positivism and Phenomenology.

- ## Methodology & Plan:

  a) Clarify research designs.

  b) Help researchers decide which design to choose the philosophy can help understand the limitations of some approaches.

  c) Enable researcher to create designs that they have not done so previously; it can also provide researchers to adopt previous research designs to different subjects.

- **Types of Research Methods:** There are three Types of these Methods

1. **Quantitative research:** Quantitative research can also be used to seek previously identified variables and implement in the current research. The main strategy of obtaining quantitative data is through the use of questionnaires and interviews.

2. **Qualitative Research:** It's aim to provide an in-depth understanding of people's experience, perspectives and histories in the context of their personal circumstances or setting. This approach utilises many data collection methods such as- case studies, interviews, group discussion, participant observation and documents and records analysis.

3. **A Mixed, Multi-methods Approach:** The multi-method approach is very beneficial because both methods complement each other rather than competing and ensure that the advantages of both approaches are enhances and the weaknesses are minimised.

- **Questionnaire Survey Data Analysis :** This part will present the results achieved from questionnaire data analysis that has been collected from the result of questioning of materials procurement managers been invited within the oil industry.

- *Q-1 How would you classify your organization in terms of size?*

- *Q-2 Years of practicing equipment, material procurement and procurement process ?*

- *Q-3 ISO certified ?*

- *Q-4 Methods of Risk Identification, Analysis/Assessment , Risk Mitigation, Risk Monitoring, Performance ?*

- **General Risk Profiles :**

- *What are the challenging risks you most frequently face during the procurement process? Why are they most important ones?*
- *Is there any reason why these risks appear frequently?*
- *What are the impacts, likelihood and predictability of these risks?*
- *Can these risks be reduced/managed?*

- **Determinants of the Strategies :**

- *Do you use any system for documenting incidents i.e. tools, software or contingency plans to monitor or mitigate the consequences of these risks?*

- **Outcome of the Strategies :**

- *Are you satisfied regarding the performance of your procurement team in terms of managing/mitigating risks? Can this performance be increased through training?*
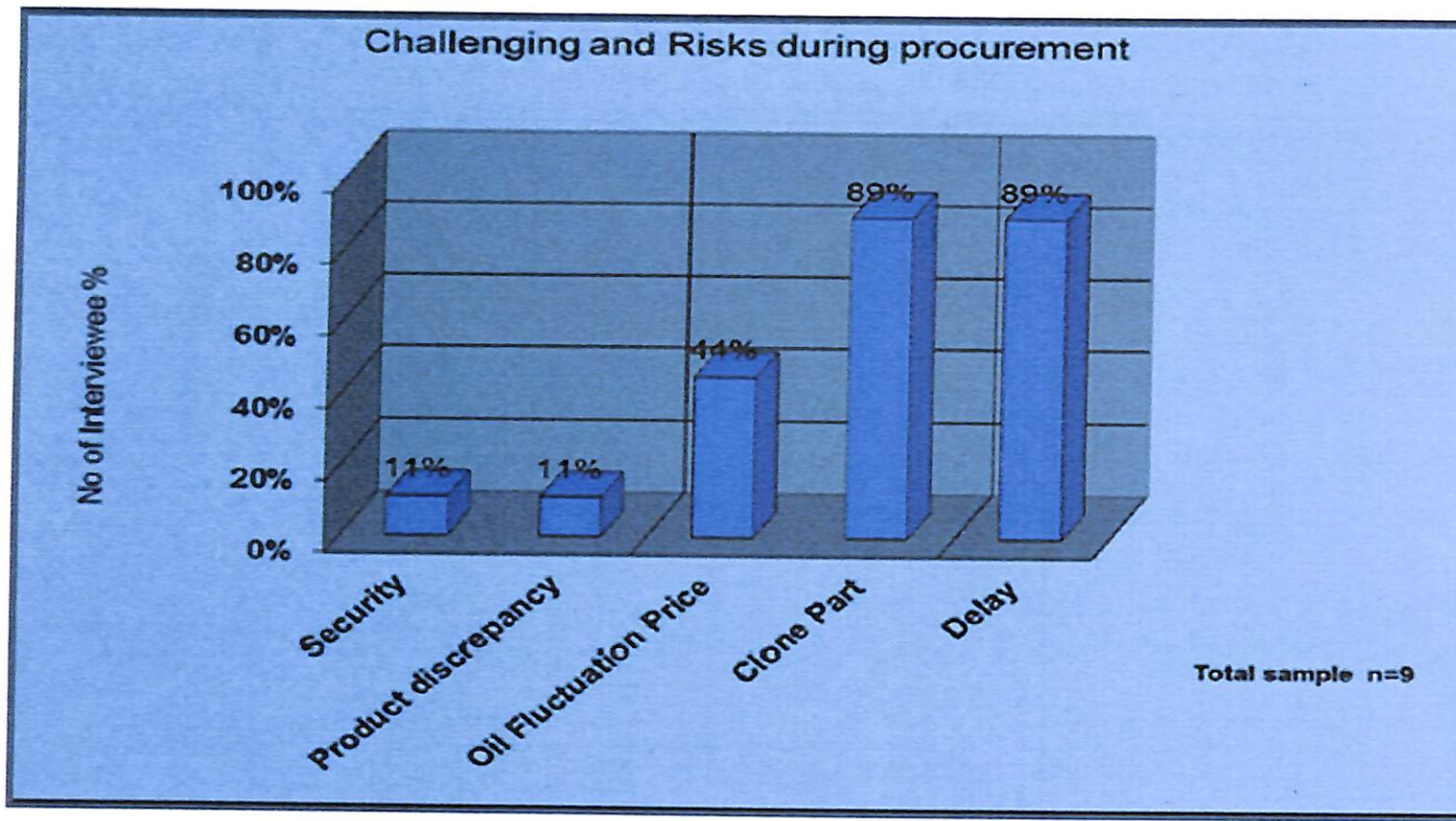
- **Interview Findings :**

- Most of the interviewees mention Oil Fluctuation Price, Product Discrepancy, Security, Clone Part, and Delay as the most challenging risks that they frequently face during the procurement process.

- Another risk facing is specifically with suppliers who by mistake supply unoriginal parts or equipment (clones), this issue can harm our project timetable, hence identifying clone parts is important to prevent such delay".

Pictorial Presentation :

The Challenge and Risks found in the Interview during Procurement

Pictorial Presentation :

Reduced and managed the risks

No of Interviewee %

Add budget — 11%
Clear required specifications to supplier — 44%
Expertise — 58%
Select supplier — 67%
Original parts — 67%

Total sample n=9
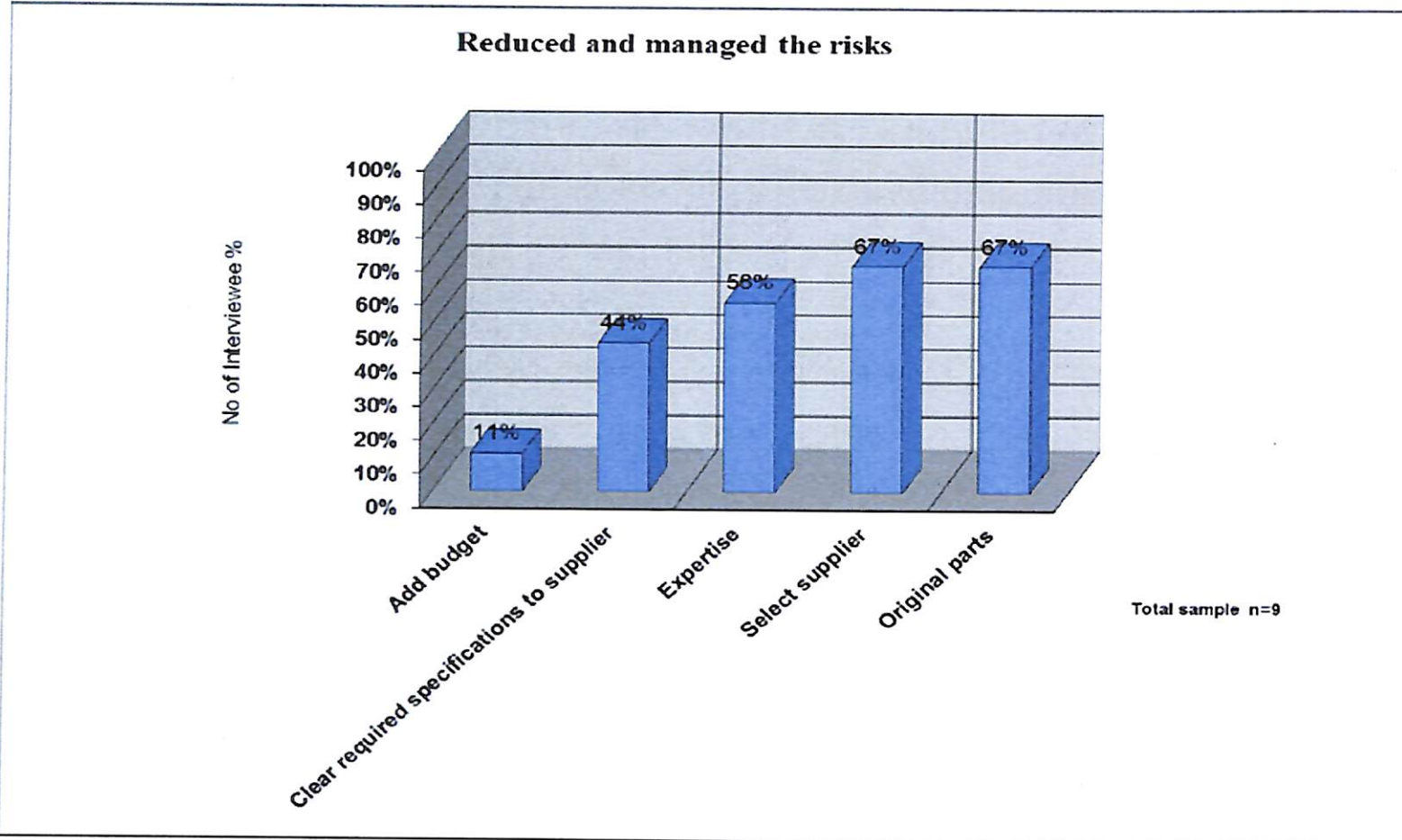
Interviewee's Answer on How to Reduce and Manage the Risks

- # Conclusion & Scope of Future Work :

- **Research Summary** : The approach incorporated the two methodologies, quantitative and qualitative to address knowledge gaps and produce experimental research. The concept of Risk Management (RM) is identified as a way of mitigating the challenges faced by procurement managers affected by risk factors.

- **Originality of the Research**: The essence of this study is to provide a significant addition to existing knowledge in research which should be based on idea or concept novelty. Therefore, this is believed to have met the criteria of study uniqueness, capability, and knowledge contribution.

- **Research questions and findings :**

  1. Identified and analysed various risks in material procurement operations.

  2. Examined the risk strategies for managing these risks.

  3. In relations with organisational orientations.

CONCLUSION

Generally oil & gas organization should view their supply chain pattern & coordination systems as worthy of improvement. This process involves relationship management by the company. Both customer and supplier relations are key to effective coordination of supply chain.

There is need to ensure each company or operator along the supply chain can respond quickly to the exact material needs of the customer, protect itself from problems of suppliers, and buffer its operations from the demand and supply uncertainty it faces.

The industry will need to carefully align the supply chain structures and processes with the overall company strategy. In order to enhance the overall effect of supply chain in petroleum industry the research and application of Information Technology must be given utmost importance.

THANK YOU