



ENTERPRISE RISK MANAGEMENT ANALYSIS- CASE STUDY OF A  
PETROCHEMICAL COMPANY IN QATAR

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## **PREFACE**

This thesis is conducted by the authors as partial fulfilment requirements for a Master's in Management (MiM) in the business and economics department of Lund University in Sweden. This thesis contains unique work conducted by two master students from March to May 2016.

This thesis is based mainly upon literature review drawn from previous researches done on Enterprise Risk Management or similar topics. Moreover, a case-study was done on the data provided by a selected company in the petrochemical industries in Qatar. We have done our best in order to provide references to all sources and previous researches used.

Coming from fast growing countries, risk management is a new aspect to raise and study within a company, where most of the companies, where managers must analyze and forecast each step to manage and avoid failure possibilities. After realizing the importance of risk management through our studies in this master, we decided to pursue our master's thesis in the same aspect with the help of the Enterprise Risk Management department in the selected company. The gathered empirical information from the company helped us to reflect the theoretical framework we had in the literature review. We contributed to the company to analyze the drawn data, in addition to the treatment plans for three (3) selected risks from the Risk Register of the company.

We only look at one small aspect of the issues in order to illustrate how these tools could be applied and what might be examined.

The company's name remained confidential due to the company's policy and confidential data.

Lund, May, 2016

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## *Abbreviations*

British Petroleum (BP)

Casualty Actuarial Society (CAS)

Control Effective Matrix (CEM)

Committee of Sponsoring Organizations of the Treadway Commission (COSO)

Enterprise Risk (ER)

Enterprise Risk Management (ERM)

Health, Safety, and Environment (HSE)

Investigation Panel (IP)

Risk Assessment Criteria Matrix (RACM)

Traditional Risk Management (TRM)

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### **1.3 Introduction**

Risk defined as “possibility of loss or injury;” “the chance of loss or the perils to the subject matter of insurance contract” also “the degree of probability of such loss;” and “the chance that an investment (as a stock or commodity) will lose value” (Merriam-Webster, 2006), risk is an inevitable aspect of life. Risks require careful consideration to determine if such risk is acceptable or if it should be avoided. In the corporate world, these risks play a decisive role in determining the continuity of the enterprise. As such, risk management has evolved into a primary aspect of the decision making process for many entities through the application of risk management in the attempt to eliminate or reduce the impact of the inherent perils of risk.

Industries today are facing intense competition coupled with instant changes in customer demand and expectations. Rapid technological shifts affects organizations and pressure firms to be more innovative in order to meet consumer demands. The complexity of the globalization process to expand production, services, and communication is linked to risks that these firms will face (Subhani & Osman, 2011). The resources, services, and the environment of an organization develop enterprise risks, where organization must study and prepare an action plan to treat such risks. Furthermore, human errors, fraud, and system failure are key elements of the enterprise risk. All organizations must develop a more practical method in dealing with risks covering more than statistical and analytical future scenarios and plans (Jolly, 2003). Organizations are developing more awareness that such risk must be managed with the total organization in mind.

Furthermore, this research aims to raise the importance of Enterprise Risk Management in Qatar as it is a new aspect for companies in fast growing countries, and taking as an example a case study of a company located in Qatar (Subhani & Osman, 2011). Consequently, we are aiming to develop a treatment plan for a sample of three (3) risks through the analyzed process for the risk management department at The Company. Data is drawn from the company on different risk aspects.

General aim would be to encourage companies operating in growing countries to establish risk management departments to review risks and build a suitable treatment plan ahead of

time as good understanding of risks would be a source of competitive advantage for The Company.

## **1.2 Purpose**

*The purpose of this thesis is to present an enterprise risk management analysis for a selected company in Qatar and suggesting a treatment plan for different risks on the selected company.*

### Research Question

The following research questions was designed in order to fulfill the requirements of the thesis purpose

#### Research Question (1):

*How to identify, assess, and treat risks according to enterprise risk management framework in the company?*

#### Research Question (2):

*What are the suggestions for treating different risks to avoid failure in the selected company?*

## **1.3 Goals of the master's thesis:**

- Establish a clear understanding of ERM in a general theoretical framework.
- Define the current ERM framework of the selected company in Qatar using the data drawn from the ERM department within the firm.
- Suggest treatment plan for three (3) risks of (Severe, Medium, and high impacts) as an example of how to treat risks in hand for the company. (Analyze the importance and probability of risks and conclude with the suggested treatment plan).

## **2.1 Theoretical Background**

As a concrete example explaining the importance of risk management to start with was the incident of deep-horizon in the Gulf of Mexico, or as known as the Macondo blowout, that occurred in 2010 by British Petroleum (BP) ships due to risk management failures. These failures were a core factor leading to the offshore oil well disaster. According to the investigation panel (IP), decisions made by BP to save both cost and time, without considering any consequences or mitigations were another factor that contributed to the disaster. Furthermore, BP did not see the need of such assessments, where the probabilities were very low. The fire post the explosion at the offshore rig resulted of in the harm of numerous labors, in addition to eleven deaths (Azwell et al., 2011). Consequently, nearly five million barrels of oil poured into the Gulf of Mexico causing other environmental disasters.

BP applied new assessment procedures post to the Macondo Blowout to be stricter involved understanding what hazards they faced, as well as more balances to prevent future similar accidents (Azwell et al., 2011).

The concept of risk management first emerged around 2100 BC to provide a type of insurance in instances where ships and their cargo were lost at sea. This method remained in place until the 1960s and 1970s when insurers encouraged the implementation of safety procedures in the workplace to reduce the number of claims filed which would reduce their potential losses and is recognized as the “first age of risk management” (Sadgrove, 2015: 1). The second age of risk management occurred during the 1970s and 1980s with the introduction and implementation of quality assurance through which companies ensured products adhered to their specifications and potential risk was addressed more proactively. Sadgrove (2015) supported this, where he discussed legislation implemented by governments supported these measures and strongly encouraged employers to address risks presented to workers and consumers. In addition, the risks presented to the environment began to emerge during the 1980s. The third age of risk management occurred in 1995 with the introduction of the first universal risk management standard as presented by Standards Australia, AS/NZS 4360:1995 and was soon followed by the introduction of Canada’s standard, CAN/CSA-Q850-97. These

standards expanded the scope of traditional risks associated with businesses to address the concerns associated with entrepreneurial risks (Sadgrove, 2015: 1-2).

Razali & Tahir (2011) discussed that Enterprise Risk Management (ERM) differs from the Traditional Risk Management (TRM), where they discussed how different authors defined ERM for organizations. Starting with the CAS or Casualty Actuarial Society (2003) definition of ERM as a goal to achieve increasing of the “*organization’s short- and Long-term value to its stakeholders*” by assessing, controlling, exploiting, financing, and monitoring the risks of all department within the firm (Razali & Tahir, 2011:1). On the other hand, ERM was defined by Lam (2000) as an integration of managing the risks on different aspects such as: credit, market, operational, economical, and transfer to make the most of a firm’s value. As per Alvinunessen and Jankensgard (2009), ERM is an approach for the whole company to manage the risk and centralize the information “according to the risk exposures” (Razali & Tahir, 2011:1). Risk affecting future cash-flow and the entity of the company is a universal risk that if acknowledged, the management team could take a step further to access the likelihood and the impact of the risk based on the firm’s objective (Alvinunessen & Jankensgard, 2009).

The Committee of Sponsoring Organizations of the Treadway Commission (COSO) developed an integrated Framework to help companies to enhance their risk management systems (Connell, 2005). Furthermore, this framework was promoted by international auditing and accounting firms after it was developed during the 1990s, thus, this framework was adopted widely by many companies and it developed trust after proving success. According to COSO, ERM is defined as “a process affected by an entity's board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risks to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives” (COSO, 2004; Connell, 2005:2). Comparing the COSO to other frameworks will show many similarities, but still have some differences in the ERM components. Moreover, COSO framework mainly place greater responsibility upon the shareholders, requiring their support and direct involvement in the ERM process (rims, 2011:8). However, the COSO framework was criticized by rims (2011) in the idea of some activities such as not going for the “root cause analysis or business resiliency and sustainability” (rims, 2011:8). These flaws of the framework require companies

implementing the COSO to consider additional risk management techniques to identify and enhance the gaps of this framework.

## **2.2 The Purpose of Risk Management**

Risk management addresses two types of business risks consisting of the traditional non-entrepreneurial risks associated with fire, pollution, or fraud and the entrepreneurial risks associated with events such as the construction of a new plant, launching a new product, or acquiring another company. While insurance is available to provide compensation for catastrophic events, entrepreneurial risks require certain measures provided through the framework of risk management to eliminate or reduce the impact of the associated risks.

## **2.3 Risk Management Procedure**

The traditional method of risk management was applied in a solo approach, addressing one risk at a time without consideration of the interrelationship among risks. Grace et al. (2010) further built up on these theories to introduce the modern approach, commonly known as ERM, which provides risks to be addressed simultaneously. ERM provides an integrated or portfolio approach to risk management through the application of an enterprise level assessment, quantification, financing, and management of risk. The interaction of one risk with the company's portfolio or other priority risks is assessed through the methodology provided with ERM (Grace et al., 2010).

Risk Management is a continuous process in which potential risks are assessed, identified, and addressed as shown in figure 1. The framework in developing a risk management plan serves as the basic guideline as each project or area of consideration requires customization to address the specific risks at that area as the risks will vary even though some risks are present in multiple areas.

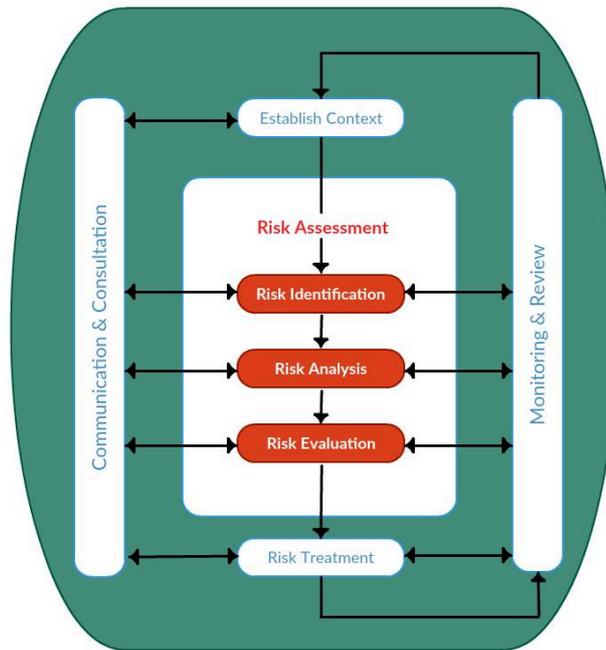


Figure 1 Risk Management Process (Adjusted from Purdy, 2010)

### 2.3.1 Risk Identification

Risk identification, or establishing the context as defined by Purdy (2010) in figure 1, is an integral aspect of risk management. A risk is comprised of three conceptual elements consisting of an object perceived to present a risk, a putative harm, and a specific link that is representative of a form of causation between the object and the harm (Boholm & Corvellec, 2015). In order for an object to be determined as a risk, it must first be constructed as an object. This construction could consist of natural phenomena, such as a hurricane, technological, consisting of technical artefacts including computer equipment, cultural, represented by the events of society, or behavioral, such as consuming alcohol. In addition, a linkage must be established between the object and a putative harm. This schematic relies on three elements. The first is risk objects that are deemed as being potentially dangerous. The key word is potentially as the threat associated with the identified danger relies on the potentiality of it occurring. In addition, the characteristics defining risk objects are not equitable in importance while the level of dangerousness serves as the foundation for a circumstantial framing. The second element is the determination of value to the object. The value associated with the object is circumstantial and contextual while being utilized as a measure to determine the amount of protection it warrants. The third element consists of the relationships of

risks that are built on connections and associations. The relationships of risks apply conjectures, narratives, and other methods of determination and can rely on hypothetical causes. However, causality is required as the relationship is defined by the potential of damage that threatens the object at risk as based on the valuation of that object (Boholm & Corvellec, 2015).

The valuation process refers to the methodology that is applied to assign value to an object; however, value is diverse as it relies on the judgement and opinions of individuals and can vary widely between one individual and another. Value is the result of the complicated process involving the identification, definition, hierarchy, and calculations reflective of the societal opinions that determine the worthiness of an object to be afforded value (Boholm & Corvellec, 2015). The valuation process relies on several factors, such as legal assessments and mathematical algorithms in conjunction with traditions, historical commitments, and modes of accountability. The daily dynamics of the corporate world is driven by valuation on all levels and is a continuous process (Tchankova, 2002).

### **2.3.2 Risk Analysis**

An important facet of risk management is risk analysis. Risk analysis provides the ability to study the causes of uncertainty that are possible in any given course of action. This can apply to the forecasted future cash flow streams, variations of portfolio or stock returns, the probability of success or failure of a project, and the potential future economic states (Ansell & Wharton, 1992). Risk analysis is approached through two methodologies consisting of qualitative and quantitative methods.

#### **2.3.2.1 Qualitative Risk Analysis**

The most commonly applied method of risk analysis utilized in the decision making process is recognized through the methodology of qualitative risk analysis. This method is most appropriate in situations that contain a lower level of risk as it is not reflective of a full analysis or in instances when the available numerical data is insufficient to support a quantitative analysis to provide a more detailed analysis of the risk. Qualitative risk analysis utilizes the use of brainstorming, questionnaires and structured interviews,

evaluations for multidisciplinary groups, and the opinions and judgements of specialists and experts, which is also referred to as the “Delphi Technique” (Risk Analysis, n.d.). Qualitative risk analysis relies on description and narration of the risk, and relative values mostly obtained by ranking or separating risks into descriptive rating like high, medium, low and no risk (Yoe, 2011). This kind of rating facilitates the understanding of risk assessment by decreasing the needed calculations and inputs to a convenient set of judgments. When the relative values are numeric but nominal or ordinal in character such as when index numbers are used the risk estimate is said to be semi-quantitative, but they remain more qualitative rather than quantitative in character (Yoe, 2011). The use of qualitative risk analysis is useful when less details are needed or when the availability of details are missing for risk management decision making. Qualitative assessment is characterized with flexibility and consistency. When uncertainty is great, a qualitative risk assessment could be the best available option (Yoe, 2011). Qualitative risk analysis gives information which is used to prioritize risk (Kendrick, 2015). Qualitative methods are not accurate in general, but they do provide a way to combine consideration of risk outcomes that cannot be easily measured (Kendrick, 2015).

### **2.3.2.2 Quantitative Risk Analysis**

Quantitative risk analysis provides the ability to assign values to occurrences of identified risks to utilize in calculating the level of risk of a project. The methodology of a quantitative risk analysis provides an analysis of the likelihood of a risk occurring, an analysis of the potential consequences as a result of the occurrence of a risk, and allows for computer simulations to be applied to assess the risks and consequences (Yoe, 2011). Various mechanisms can be applied to the development of the measurements to be utilized through a quantitative risk analysis. In particular, the Monte Carlo method applies a broader vision to the analysis to demonstrate a wider range of possible scenarios; it applies simplicity to the application, and is suited for performing computer simulations. The Monte Carlo method utilizes a mathematical risk model simulate reality by randomly assigning values to the variables of the model to represent various scenarios to obtain cohesive results (Kendrick, 2015). This method is often automated to generate a sufficient sampling to provide a wide range of representations of actual situations. The results are then used in a statistical study through which relevant conclusions provide the basis concerning the risk associated with the project by establishing the mean, minimum,

and maximum values, standard deviations, variations, and the likelihood of the different variables occurring to apply as the measure of risk (Risk Analysis, n.d.). Quantitative risk analysis relies on numerical expression of the risk (Yoe, 2011). Quantitative risk analysis give information which is used to measure risk, and the quantitative methods aim for high accuracy with more revealing more details about each risk (Kendrick, 2015).

### **2.3.3 Risk Evaluation**

In a landmark study, Hancock (2015) argued that Risk analysis is performed with the objective of minimizing potential risks by implementing a rating system based on the potential impact of any given risk; as assigning classifications through the use of a numerical rating from one (1) to five (5) provides a simple method of identifying the level of harm a risk presents. Risks that present a very low, or negligible, impact would be noted as a one (1). These risks present little to no impact on the financial stability of the company or in the relationship between the company and its customers. A two (2) rating signifies a low or minor risk that presents a minor impact to the finances and customer relationships of a company. Moderate risks are assigned a signifier of three (3) and present a notable financial impact and moderate strain or dissatisfaction among customers of a company and may be afforded some media coverage. Serious or high risk events result in an increased impact in the areas relating to finances, customer satisfaction, and customer relationships are dissolved. Media coverage often increases to obtain national coverage. Catastrophic or a very high impact are categorized as five (5) and imperils the solvency of the company as the majority of the customer relationships are negated, and media coverage increases to encompass national and international outlets (Hancock, 2015).

### **2.3.4 Risk Response**

Risk management also entails determining appropriate courses of action to apply, dependent on the type and severity of the risk. According to Hall (2015), there are four primary courses of action consisting of avoidance, transference, mitigate, and accept. These courses can be applied independently or in conjunction. When avoidance is applied, the threat is eliminated or removed by removing the cause of the threat. In many instances, avoidance can be applied by increasing the scope of the project or by

increasing quality measures. Transference occurs when another party assumes responsibility for a risk. This is accomplished through purchasing insurance, performance bonds, warranties, guarantees, or by outsourcing the risk through other means. Mitigating a risk provides a strategy to reduce the probability or the impact of a given risk. In many situations, the probability and the impact can be approached independently; however, the course of action that yields the highest reduction results for both is normally selected. However, Issa (2015) added that if the risk is determined to be acceptable, acceptance is applied and the effects of the risk are permitted to occur without further intervention.

### **2.3.5 Risk Monitoring, Controlling, and Reporting**

Once risks have been identified, it is imperative to apply measures to monitor these efforts. Risk monitoring provides the ability to track identified risks, apply continued monitoring efforts for residual risks, and identify emerging risks. This is performed to evaluate the effectiveness of the risk management efforts as well as ensuring the risk plan was executed appropriately (WBS Management & Training, 2000). The information obtained from the monitoring efforts is then utilized to serve as guidance in making subsequent decisions concerning risks. According to Alvinunessen and Jankensgard (2009), risk monitoring provides focus on several areas, such as ensuring risk responses were implemented in accordance with the applicable plans, determining if the risk response actions were effective or if alternate responses should be developed, assess the continued validity of the project assumptions, to determine if the risk exposure has changed or altered dependent on an analysis of trends, to determine if a risk trigger has occurred, to ensure that adherence of all applicable policies and procedures has been maintained, and to determine if risks that were not identified previously have emerged. Risk monitoring, controlling, and reporting also encompasses all official communications pertaining to the project, such as work results and other project records and all subsequent reports, including unplanned workarounds that are applied, corrective actions that are implemented, any updates or alterations to the risk response plan, and updates to the risk identification checklist (WBS Management & Training, 2000). In addition, risk monitoring, controlling, and reporting often employs the use of a risk database to serve as a repository for the collection, maintenance, and analysis of the data gathered through the risk management process and serves to form the foundation of a risk lessons learned program (WBS Management & Training, 2000).

## **3.0 Methodology**

### **3.1 Research Approach**

The thesis is conducted by a study on a Qatari company which operates in petrochemical goods, in order to analyze enterprise risk management throughout the company. This study will focus on the importance of risk management in the decision-making process. The thesis is driven by an abductive approach, based on the data collected by the researchers and the enterprise risk management framework (Saunders et al., 2016). After analyzing the given data, the researchers suggested a treatment plan for measuring the risk to help the company mitigate possible failure of a certain project, in addition to reduce the likelihood of risks. The authors started the research by searching for previous literature through scientific papers, journals, books, and online resources covered the same or similar research. Furthermore, collected literature will assist the researchers to build a solid background of data to fulfil the purpose of the research. In terms of theory, the authors are looking to verify and analyze an existing framework designed by risk management expertise in the past (Saunders et al., 2016). Moreover, analyzing the adjusted framework by the data provided through the selected company to recognize the risk. Finally, suggest a risk treatment plan based on enterprise risk management framework.

### **3.2 Research Strategy**

This thesis is conducted by a qualitative method as a flexible strategy to provide in-depth and detailed data analysis and clear observation various aspects, where this method was reflected on the focus of identifying, assessing, and treating risks (Bryman & Bell, 2007). According to Patton (2002), qualitative method is used to explain and explore the data collected and relate it to the assessment process, rather than setting a value for something. Moreover, clarifying the concept of ERM fulfils the exploratory and explanatory aims of qualitative strategy by describing the framework of risk management found in the literature (Saunders et al., 2016). Additionally, this research took the approach of case-study as Smoekh and Lewin (2005) argues that such an approach will enrich the

description of the research and support the achieved results. Furthermore, the approach of a case-study for such cases will deepen more the understanding of the readers and widen the possibility of future researches.

### **3.3 Data Collection**

Data has been collected from documents available from the company in order to give convenient answer for the research question. This thesis is built on both primary and secondary data which were collected from the company (Bryman & Bell, 2007). One of the authors visited the company and observed the structure of ERM department in the selected company. The researcher made informal interviews with representatives in the ERM department in order to know how the risk is treated starting with identification and ending with the treatment (this process is described in chapter four). The informal interviews made the observation of the process more accessible and facilitate the communication with the representatives to give clear answers regarding the process. The author registered the steps of the process in order to analyze the data which is provided later on by the company. These collected steps considered as primary data (Saunders et al., 2016).

The data gathered by the authors were provided by the company as an unofficial copy. These data are considered as secondary data as Saunders et al. (2016) discussed in his book. The secondary data consisted of the risk register for the third (3<sup>rd</sup>) quarter in 2015, in addition to the assessment criteria implemented by the ERM department in the company.

The authors applied the process of risk analysis on three (3) examples from the collected data with different level of severity and category in order to clarify the process of assessing risks. The first risk selected is a compliance one with a Schedule risk title and risk description that clarifying the inability to comply with project schedule may result in project cost overruns and financial losses. The second selected risk is strategic with Centralized Monitoring Unit title and risk description that the absence of a centralized unit to utilize surplus spare parts from different projects may result in unnecessary cost being incurred and/or project delays. The final selected risk is operational with Project Design title and described as inappropriate risk design leading to project inefficacies, increased costs and the inability to achieve project objectives.

The analysis of the data is done by the authors by relating the variables according to Risk Rating Matrix in order to have deeper understanding for the process and live up to the aim of the study.

### **3.4 Reliability**

Reliability in qualitative study is reflected when the authors presented the approach of study in a consistent way (Creswell, 2009). The author applied the same process to analyze three (3) different kinds of risk in the company. Furthermore, the authors believe that the reliability in this thesis is debatable issue and think that the result may vary according to the type of business; also the process could be different in the other companies with consideration for any kind of adjustments and improvements for future research. On the other hand, if the study carried out in the same situation within the same country, the results would be very similar. The authors are doing their thesis in a clear process and ensure that all parts are explained in transparent way in order to grant others the chance to judge the research. The reliability is very important to ensure the quality of the research, but it is not the only thing to consider; where validity is important as well (Saunders et al., 2016).

### **3.5 Validity**

The purpose of validity is to evaluate whether the study instrument actually measures what is intended to be measured or not (Bryman & Bell, 2007). The authors applied the observed process on the collected data in order to measure the risk. In reference to Creswell (2009), validity in qualitative study indicate that the researchers apply specific procedures to make sure of the accuracy of the findings; and the findings supposed to be checked from researchers, the readers or the participant's point of view. The authors believe that this thesis aims to achieve high validity. Furthermore, this thesis is not generalizable for the whole sector of petrochemical business.

### **3.6 Limitations**

This research recognized that the adopted framework of the selected company is adjusted to fit that certain company and similar companies; therefore, it cannot be generalized to all firms. However, adjustments in different companies will not affect the core of risk assessment process analyzed in this research to enhance the understanding of Enterprise risk management. Our specific suggestions for the treatment plan are specific to the company selected or similar companies in the same sector and country. This is because the regulations and policies might differ in other countries or different sectors. Nevertheless, analyzing the process of enterprise risk management can be used as general guideline or a base ground to assess risks with different level of severity.

Furthermore, the data collected from the company was unofficial documents that cannot be published. This required the name of the company to be anonymized throughout the research. Moreover, as the company agreed for one of the researchers to directly observe the process, employees and departments was unable to have formal interviews due to company regulations. As a result, the punctuality of the process might be slightly affected.

## **4.1 Case-Study in the selected Company**

To live up to the purpose of this research, a petrochemical company located in Qatar was selected as an example to study their ERM. The case study will start by analyzing the current ERM framework adopted by the company and followed by the process of how to identify, assess, and treat risks with different severity levels within the company.

After answering the research question of analyzing the process of risk assessment within the company, an example of how risks are treated will be reflected by a suggested treatment plan for three selected risks as an example of different levels of severity.

All data were drawn from an internal source in the company, in addition to direct observation by one of the researchers. Names were anonymized due to legal restrictions from the company.

## **4.2 Introduction of the Company**

The Company was founded in 1960's as a joint venture between the Government and a number of foreign shareholders. The company is now considered as one of the country's large-scale ventures in the petrochemical sector, with the vision to diversify the economy using the country's massive gas reserve. Over the past three decades, the company succeeded to implement several projects and expanded massively to be evolved into a world-class fertilizer producer or many chemical products. The company is now owned seventy percent (70%) by the government and thirty percent (30%) by foreign shareholder.

The Company's main production is petrochemical goods and considered as one of the largest producers in the world. Furthermore, the company now seeks to increase the production of other types of products to minimize the environmental impacts. The current vision of the company of retaining existing customers, in addition to establishing new ones require the company to enlarge itself continually. Hence, this expansion will rapidly increase the importance of risk management within the company to identify risks and avoid it whilst maintain quality of products, services, and level of commitment.

### **4.3 ERM in The Company**

ERM concept in The Company was initially established in 2010s to have more managerial focus to live up to the company's vision of expanding locally and internationally. Furthermore, the company implemented ERM framework in order to have a systematic and integrated approach to managing all risks, with main focus on board supervision, identifying, assessment, management, reporting and monitoring of all major risks in a cohesive framework. Moreover, risk management department was established to have responsibilities for the overall risk management within the company and keep an eye on many factors (External or Internal) which can result in the shift of activities away from the corporate objectives. Risk management department is also responsible to forecast and minimize all types of risks within the company such as (Compliance, Financial, strategic, and operational risks). In the event of any risk, the department should implement a suitable treatment plan to either reduce or eliminate the risk, in addition to the monitoring and controlling of the risk to avoid future changes.

Risk Management Department structure (shown in figure 2) is designed to identify and rectify risks related to business, so as to assure high security for the company shareholders' investments. Furthermore, an effectively functioning governance structure ensures risk ownership is assigned in a timely manner, communication plans are clear and competently executed, resources are allocated to risk management, staffing is sufficient, and training practices are in place. Moreover, the risk governance structure ensures that employees at all levels play an active role in the risk management process. In addition, the structure outlines specific roles and responsibilities of those involved in risk taking and risk monitoring activities.

Effective communication between the key committees and the ERM coordinator is critical to manage risks effectively, where the following figure 2 represents the proposed ERM governance structure.

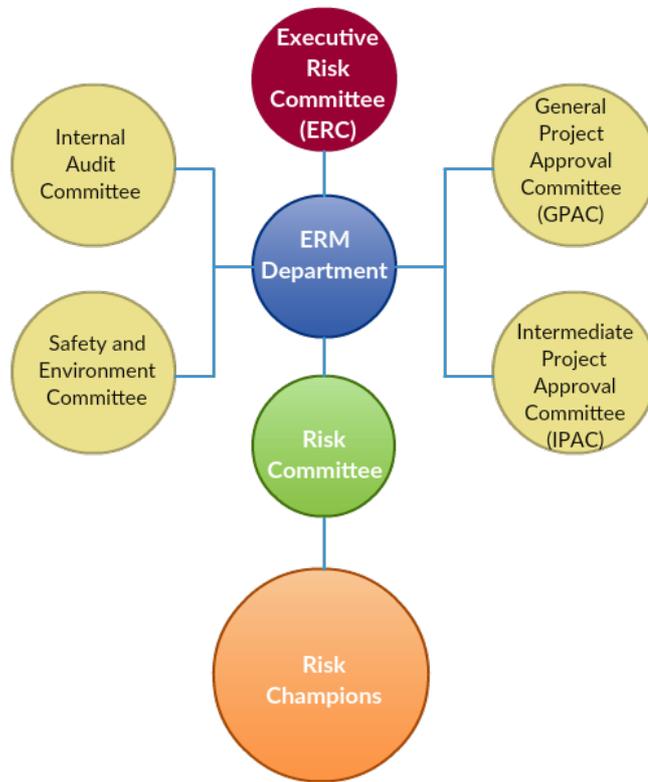


Figure 2 Risk Governance Structure (Adjusted from the Company Data, 2016)

The ERM framework describes the process of identification, assessment, management, reporting and monitoring of the key faced by The Company that may impact its business policy. After implementing the ERM framework in 2010's, The Company decided to prioritize and evaluate risks and put it through a more effective and efficient structure.

The framework adopted by the company will assist in managing the risks associated with the implementation of its business goals, in addition to balancing the risk-reward equation. Furthermore, the risk governance structure shown in previous figure (2), guarantees the decentralization of power, where each executive will have an active role in the risk management and assessment processes. In addition, The Company's internal stakeholders are critical to the process of executing the ERM framework program.

The risk champions and risk owners are representatives from each department and are responsible for participate in the risk management process and report risks to ERM function on a quarterly basis. They are also responsible to agree on ownership for risks, in addition to proposing strategies to treat those risks. However, risk champions must implement and monitor treatment of risks, while supporting the implementation of the risk management process. Champions/owners are responsible of ensuring that the risk management process is understood throughout departments. Finally, promote risk aware culture and risk management competence across the organization.

The below matrix links key risk management roles and establishes the level of accountability for each activity.

### 4.3.1 Definitions of roles and terms :

Table 1 Definitions of Roles & Terms (Adjusted from Badiru, 2011)

Roles/Terms	Definition
Risk appetite	How far an organization is prepared to pursue or hold certain type of risk.
Risk analysis	The enterprise understanding of risks and categorizing the level of risk.
Likelihood/ Probability	Likelihood is the question of what are the chances of any risk to occur. However, probability is a quantitative measure of chances to occur between zero (0) and one (1), ranging from impossibility and absolute certainty.
Exposure	Extent to which X Company and/ or stakeholders are subject to an event
Risk treatment	Process to modify risk which involves accepting, mitigating, transferring, or avoiding the risk
Inherent risk	Business intrinsic risks in the current situation, without considering any control activities.
Residual risk	The remaining risks after taking into consideration the control activities.
Monitoring	Supervision, checking, observing, and determining the status or a certain risk. This continual checking is done in order to identify any changes from the desired or expected performance level.
Risk reporting	Providing information about the current state of a particular risk to the management team.
Risk register	Risk register is the document that contains the entire qualitative and quantitative risk analysis and treatment plan. This document will include all the details of any risk (including the description, categorizing, cause, likelihood/probability of occurrence, impact, proposed treatment plan, owner, and current state of any risk).

### 4.3.2 The risk management roles are either

Table 2 Job description symbols (Adjusted from the Company Data, 2016)

Symbol	Job	Job Description
R	Responsible	Responsible for performing the activity
A	Accountable	Accountable for making the business decision and its outcome or delegating specific tasks to other employees or teams
C	Consulted	Consulted for inputs and feedback
I	Informed	Informed of the final result, task completion or deliverable distribution
F	Facilitate	Facilitate the performance of the activity or task
M	Monitor	Monitors to ensure that the activity is being addressed

### 4.3.3 Linking Roles and level of accountability

Table 3 Level of Accountability (Adjusted from the Cimpany Data, 2016)

Process	Risk Owners/Risk champions	ERM coordinator	Executive Risk Committee
Risk identification	A & R	C & F	I
Risk analysis	A & R	C & F	I
Risk evaluation	A & R	C & F	I
Risk treatment	R	C & F	A & M
Risk monitoring	R	C & F	A & M
Risk reporting	R	A & R	M & I

### 4.3.4 Risk Appetite for The Company

The executive risk committee holds discussion regarding the organization’s objectives and determines how much risk it is exposed relative to the capacity to take on risks. To align the risk profile to business policy and establish the risk appetite, the organization will undertake the following steps. First of all, The Company must identify potential risks that may impact the achievement of objectives. Secondly, identify the zero tolerance risks exposures; such as compliance risk. Further, understand the current risk taking capacity. For instance, the amount and type of risk the organization is able to support in pursuit of its business objectives taking into account its capital structure. Afterwards, consider the amount of buffer required to absorb potential losses. Then, define the risk appetite statements for key risks that impact the achievement of objectives in order to develop risk response strategies. These strategies include the organization level metrics with tolerance ranges to formalize the risk appetite. Lastly, The Company must monitor the tolerance range and associated metrics on an ongoing basis as part of the process established in risk governance structure.

The risk appetite statements and tolerance ranges in line with the defined risk assessment criteria and score card for the year 2015 were published by the company at the beginning of the year. The table below shows the risk appetite for each area within The Company.

Table 4 The Company's risk appetite (Adjusted from the company Data, 2016)

Area	Risk Appetite
<b>Production</b>	<ul style="list-style-type: none"> <li>➤ The Company has a <b>low</b> appetite for production losses and deviations from production targets.</li> <li>➤ The company has <b>no tolerance</b> for decrease in production targets by more than five percent (5%).</li> </ul>
<b>Safety, Environmental, and Quality</b>	<ul style="list-style-type: none"> <li>➤ The Company has a <b>very low</b> appetite for plant operations that compromises safety, security, and environmental requirements.</li> <li>➤ The company has <b>zero tolerance</b> for any incidents or accidents that lead to fatality and multiple serious injuries.</li> </ul>

Area	Risk Appetite
<b>Reputation</b>	<ul style="list-style-type: none"> <li>➤ The Company has a <b>very low</b> appetite for reputational risk exposure that impacts the reputation and/or brand.</li> <li>➤ The Company has <b>zero tolerance</b> for events that lead to prolonged adverse media attention and/or community/customer condemnation or loss of confidence.</li> </ul>
<b>Human Resources (HR)</b>	<ul style="list-style-type: none"> <li>➤ The Company has a <b>low</b> appetite for turnover of its employees.</li> <li>➤ The Company has <b>zero tolerance</b> for annualized attrition that exceeds 7%.</li> </ul>
<b>Financial</b>	<ul style="list-style-type: none"> <li>➤ The Company has a <b>low</b> appetite for any events that have an adverse impact on its financial position.</li> <li>➤ The company has <b>zero tolerance</b> for internal fraud.</li> <li>➤ The company has <b>zero tolerance</b> on damage to physical assets that exceed 365,000 Qatari Riyals per year.</li> <li>➤ The company has <b>zero tolerate</b> for increase in production costs against budget by more than 10%.</li> <li>➤ The company has <b>zero tolerate</b> on revenue losses against the target by more than 10%.</li> </ul>
<b>Service Distribution</b>	<ul style="list-style-type: none"> <li>➤ The Company has a <b>low</b> appetite for business disruptions and systems failures.</li> <li>➤ The Company has <b>zero tolerate</b> on forced plant shutdown that exceeds 7 days on a continuous basis.</li> <li>➤ The Company has <b>zero tolerate</b> on technology outages or system interruptions that exceed 8 hours on a continuous basis.</li> </ul>

## 4.4 The process of treating risks in the selected company

Below are the steps involved in the risk management process in the company. These steps are implemented by the company based on the COSO integrated framework discussed by different authors reflected in the literature review before. Furthermore, the general process to treat any risk within an ERM framework is to identify, assess, control, and monitor risk (Purdy, 2010; Boholm & Corvellec, 2015; Ansell & Wharton, 1992; Issa, 2015; Hall, 2015; Alvinunessen & Jankensgard, 2009).

### 4.4.1 Risk Identification

According to the data observed in the company (2016), ERM coordinator will facilitate the risk identification process with each of the departmental risk champion at the beginning of each quarter. Consequently, the risk champions along with risk owners and other representatives in the department brainstorm and document all relevant and key risks that would have an impact on their objectives in the risk register.

For instance, three risks were chosen as an example from the projects' department drawn from the risk register of the ERM department after they were reported by the risk champion of the projects' department.

Table 5 Risks chosen from the Projects' department

Risk Description
Inability to comply with project schedule may result in project cost overruns and financial losses
Absence of a centralized unit to utilize surplus spare parts from different projects may result in unnecessary costs being incurred and/ or project delays
Inappropriate project design leading to project inefficiencies, increased costs and the inability to achieve project objectives

**4.4.2 Qualitative risk assessment.**

Each risk in the departmental risk register will be assessed based on the Risk Assessment Criteria Matrix (RACM) shown in figure 4 designed by the selected company based on the risk appetite statement to determine the level of inherent risk.

In the process of qualitative risk assessment, the impact rating of each risk will be assessed. In the company, this assessment considers how any risk could impact corporate objective, reputation, financial, production, service disruption, company’s regulations, or health, safety, and environment (HSE). Impacts are not limited to these criteria, however; the RACM consider the likelihood or probability each risk will occur also assessed. The likelihood is often measured by objective methods based upon engineering analysis programs, or through the past experience of the company over the years (Cryptologic Systems Group, 2007).

The inherent risk rating will be a combination of the selected likelihood and impact ratings which are mapped into the risk rating matrix shown in figure 3. This risk rating matrix is designed based on the COSO (2004) integrated framework for assessing risk as before mentioned in the literature review.

		Likelihood				
		1	2	3	4	5
Impact	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5

Figure 3 Risk Rating Matrix (Adjusted from COSO, 2004 )

Figure 4 Risk Assessment Criteria Matrix (RACM)

The key steps include; first of all, assessing the likelihood of each risk based on the identified root causes considering no basic controls exist in place. The next step is assessing the impact of each risk based on the identified consequences, and then selecting the consequence that has the highest impact. Furthermore, mapping each of the identified consequences to the relevant impact category of the RACM to Identify and highlight any potential impact of each risk that could affect more than one department. Finally, Confirming the impact and likelihood of each risk across the department.

Once the level of inherent risk is assessed, effectiveness of existing controls will be determined based on the control effectiveness matrix (CEF) shown in figure 5. The rating of numbers represents how effective the control plan implemented is for a certain risk as also discussed before by Hancock (2015).

Description	Rating	Description	Overall Control Evaluation
Effective	5	<ul style="list-style-type: none"> <li>Controls and or/ management activities properly designed and operating as intended</li> <li>Management is confident that the controls are effective and reliable</li> </ul>	Effective
Established	4	<ul style="list-style-type: none"> <li>Controls and or/ management activities properly designed and operating with opportunities for improvements identified</li> </ul>	
Improvement Requirement	3	<ul style="list-style-type: none"> <li>Controls are only partially effective, require ongoing monitoring and may require redesigning, improving or supplementing</li> <li>Key controls and or/ management activities in place, with significant opportunities for improvement identified</li> </ul>	Partial
Ineffective	2	<ul style="list-style-type: none"> <li>Limited controls and or/ management activities in place</li> </ul>	Ineffective
Deficient	1	<ul style="list-style-type: none"> <li>Controls do not meet an acceptable standard, as many weaknesses/ inefficiencies exist</li> <li>Controls and or/ management activities are non-existent or have major deficiencies and don't operate as intended</li> </ul>	

Figure 5 Control Effective Matrix (CEM) (Adjusted from the company Data, 2016)

Key guideline includes steps as follows; Identifying controls in place in relation to the risk, to determine the control effectiveness by assigning a score to each individual control listed. Moreover, validate the overall control effectiveness by taking into consideration the full control environment for the identified risk. Upon determining the overall control effectiveness, level of residual risk is assessed. Hence, the residual risk score will be a combination of the residual likelihood and residual impact ratings which are mapped again into the risk rating matrix considering the current controls in place. This is done by assessing the residual likelihood of each risk based on the identified root causes considering the controls in place and its effectiveness. Then, assess the residual impact of each risk based on the identified consequences and selecting the consequence that has the highest impact level considering the controls and effectiveness of controls in place. Finally, confirming the residual impact and residual likelihood of each risk across the department.

After the level of residual risk is assessed, The ERM coordinator will facilitate a meeting with risk champions and risk owners and review the identified departmental risks and controls. Outcomes of the meeting would include the following:

- Ranking of risks according to their agreed assessments.
- Identifying common risks at the departmental level whose aggregate impact is significant at the organizational level.

In figure 6 below, is an example from the risk register for the selected company for risks which were identified by the management team of the selected company in September 2015 is presented.

Risk Register										
Risk Ref	Date	Department/Section	Risk Category	Risk Title	Risk Description	Impact	Likelihood	Inherent Risk Rating	Severity Level	
1	2015-09-20	Projects	Compliance	Schedule	Inability to comply with project schedule may result in project cost overruns and financial losses			0		
2	2015-09-20	Projects	Strategic	Centralized Monitoring Unit	Absence of a centralized unit to utilize surplus spare parts from different projects may result in unnecessary costs being incurred and/ or project delays			0		
3	2015-09-20	Projects	Operational	Project Design	Inappropriate project design leading to project inefficiencies, increased costs and the inability to achieve project objectives			0		

Figure 6 Data before risk assessment



Risk Register										
Risk Ref	Date	Department/Section	Risk Category	Risk Title	Risk Description	Impact	Likelihood	Inherent Risk Rating	Severity Level	
1	2015-09-20	Projects	Compliance	Schedule	Inability to comply with project schedule may result in project cost overruns and financial losses	3	5	15	High	
2	2015-09-20	Projects	Strategic	Centralized Monitoring Unit	Absence of a centralized unit to utilize surplus spare parts from different projects may result in unnecessary costs being incurred and/ or project delays	1	4	4	Low	
3	2014-09-20	Projects	Operational	Project Design	Inappropriate project design leading to project inefficiencies, increased costs and the inability to achieve project objectives	3	3	9	Medium	

Figure 7 data after risk assessment with severity level

For each identified risk likelihood and impact were assessed from the RACM according to the described assessment criteria and then were filled in the risk register as shown in figure 7. For example, the first risk of *Inability to comply with project schedule may result in project cost overruns and financial losses* will have medium financial impact of cost overrun, and could occur several times a year. After plotting this into the RACM, the impact score will be three (3) and likelihood is five (5). Hence, they are automatically ranked as follows:

$$Impact \times Likelihood = Inherent Risk Rating$$

The primary reason for risk ranking is focusing the attention of management efforts on those risks that exhibit the greatest potential to have a negative impact. As for the risk in hand, the inherent risk will be fifteen (15) and leveled as *severe* risk.

The three (3) risks were selected as an example for assessment; as they were chosen with three different level of severity. Moreover, the selected risks are plotted to the heat map as show in figure 7:

- 1- Inability to comply with project schedule may result in project cost overruns and financial losses.
- 2- Absence of a centralized unit to utilize surplus spare parts from different projects may result in unnecessary costs being incurred and/ or project delays.
- 3- Inappropriate project design leading to project inefficiencies, increased costs and the inability to achieve project objectives.

		Likelihood				
		1	2	3	4	5
Impact	5					
	4					
	3			3		1
	2					
	1				2	

Figure 8 Heat Map for Selected Risks

Color Code	Risk Classification	Risk Rating Ranges
	Severe	21 to 25
	High	15 to 20
	Medium	6 to 14
	Low	1 to 5

Figure 9 Risk Classification & Rating Ranges

The Heat Map is categorized in four colors, dark red, red, yellow, and green, from top right corner to bottom left. The most significant zone of the heat map is the top right hand corner, in dark red, where the risks have the highest probability and the highest possible impact. The risks plotted in dark red are considered to be critical and are considered to be in need of the most urgent consideration; where according to previous figure 9 is classified as severe and has the rating ranges of twenty-one (21) to twenty-five (25).

Those in the red area are high risks with rating range from fifteen (15) to twenty (20), that will also need continuous management effort to manage them to acceptable levels whilst those in the yellow area are in-need of regular review and management updates, where its classification considered as Medium and ranged from six (6) to fourteen (14).

The risks in the green area are the low classified risks. Low risks need to be monitored and assessed to ascertain if too much resource is being expended on managing them to such a low level. Such an assessment is always completed in a critical manner. All risks in the critical zone of the heat map need to be reported and highlighted to the company's Risk director immediately for suitable treatment.

#### **4.5 Risk Treatment, Monitoring, and Control in The Company**

Once the residual risk scores are identified and prioritized, risk treatment takes place by determining a suitable plan to which these actions can reduce the risk's impact or likelihood or both.

According to the COSO framework (2004), the company adjusted the framework to fit the industry and the company's requirements and regulations to establish the new framework of the company. The treatment plan can be acceptance of the prioritized risk in order to pursue an opportunity or making an informed decision to retain the risk, Mitigate/ Manage the risk to reduce the impact of a risk and/or the likelihood of its occurrence, transfer the risk and share it with a third party or parties (i.e. via contractual agreements, risk financing, and insurance). Finally, avoid the risk by choosing not to start or continue with an activity that could lead to a risk. The risk champion will document preliminary risk treatment plans in coordination with the risk owner taking into consideration the following the effectiveness of the current treatment plans at reducing the impact and/or likelihood of the risk, the level of residual risk exposure, and the cost versus benefit of treatment option

while considering the residual risk score. Lastly, the risk owner will review and validate the risk treatment plans and submits the report to ERM coordinator.

#### **4.6 Treatment Plan suggestions**

The last aim of this thesis is to try and develop a suitable treatment plan for the selected three (3) risks from each category of the heat map. The first risk was the *inability to comply with project schedule, where this may result in project cost overruns and financial losses*. Furthermore, The Company has very low appetite for any project cost overruns and financial losses. Unfortunately, in the area of project management nowadays, cost overruns due to the inability to comply with deadlines are the norm, rather than the exception. According to Venkataraman & Pinto (2011), the key features that outline a successful project are the efficient cost managing, and creating and increasing the value. These key features will draw the complete picture for the project stakeholders on understanding the activities and capitals needed to achieve the project objectives. In addition, it will enable them to understand the necessary expenses to complete the project, as well as satisfy the customer's demand (Venkataraman & Pinto, 2011).

Risk Monitoring is the supervision, checking, observing, and determining the status or a certain risk. This continues checking is done in order to identify any changes from the desired or expected performance level. Risk monitoring is done by ERM coordinator, where he/she has to meet the executive risk committee at the end of each quarter to present the consolidated risk report, which includes the risk treatment plans. During the meeting with the executive risk committee, the ERM coordinator discusses all high impact and likelihood risks with high residual risk scores and determines the top risks which would have an overall impact on organization's objectives. Additionally, ERM coordinator and executive risk committee have to determine the effectiveness of the current treatment plans at responding to these risks. Further, discuss and verify cross-departmental risk treatment strategies with coverage gaps or overlaps. Finally, documentation of all meeting outcomes and approvals on all treatment plans and strategies into the risk register.

After the risk register is approved by the executive risk committee, the ERM coordinator schedules meeting with departmental risk champions and owners and provides an update on executive risk committee meeting. After this meeting, the risk owner will have to implement all approved risk treatment plans within the agreed timeline and report to the

ERM function on a periodic basis. In addition, monitor the treatment plans and report all tolerance breaches if any back to the ERM coordinator. Afterwards, prepare risk treatment implementation reports, reassess the level of residual risk and submit the same to the ERM coordinator. Finally, the ERM Coordinator will collate and review the status of the risk treatment plans and risk register, then report it to the executive risk committee.

The treatment plan for such risk classified as 'high' risk is to mitigate the risk and reduce the likelihood of its occurrence by delivering value. As drawn by Venkataraman and Pinto, a suitable treatment plan to avoid project overruns could be by integrating project cost and value by way of meeting the clients' demands at the price of their available budget, in addition minimizing the impact of unavoidable risks that may affect the outcome of the project. The main requirement for project success and comply project scheduling is by team approach, with representation from project stakeholders, client, project team, designers, responsible people for implementing the project facility, and all potential operators. In essence, the team approach should include investors who are well-informed about the project and have decision making power. This team should focus on the final objectives, targeting on areas that will maximize the benefit and value. Finally, the team should be led by a skilled, cost-oriented project management facilitator.

The second risk was the *absence of a centralized unit to utilize surplus spare parts from different projects that may result in unnecessary costs for the project* and was categorized as a low risk, where it had very low impact on the project/company. Hence, treatment plan can be an acceptance of the risk, where it would not affect the project and it can be pursued. However, the likelihood of this project is high even though it falls into the green zone of the heat map, and therefore, a suitable monitoring treatment plan must be developed and ready in order for the risk to be assessed when it happens. Surplus materials and components often are found post the completion of a certain project. Furthermore, sensible consideration must be given to these surplus and dispose it in a costly effective way. On one hand, a treatment plan suggestion could be to pre-allocate these surplus materials into the warehouse for the time, and manage to use it on other projects if possible. However, before sending the surplus into the warehouse, a known project must be determined to be used on in order to effectively arrange the warehouse materials. According to Flouris and Lock (2012), some of the materials must be inspected and issue an inspection release document for "*future traceability* (Flouris & Lock, 2012:481). On the other hand, some of the surplus materials may be saleable to other companies and

considered as transfer the risk, where this treatment is more effective than keeping the materials in store as its worth can be expected to fall downwards and considered as a financial loss to the company (Flouris & Lock, 2012).

The third selected risk is the medium classified risk of *inappropriate project design which may lead to project inefficiencies, increased costs, and the inability to achieve project objectives*. It is important to note that following blue print of the client's requirement to achieve good input to project execution are often mapped out initially based on the project design. Thus, design errors' impact was classified as moderate in the risk register, where it will result in wrong or insufficient project deliverables but not high impact of crucial financial loss or project hold. Buys (2015) argues in his article that inappropriate design will lead to wrong application and strategies and will deflect achieving the desired results, and thus, will lead to delay and slight over cost. Moreover, treatment plan suggested avoiding design errors are:

- Adequate site investigation before starting the design.
- Involvement of professional skills throughout the designing process.
- Improve the communication between the design team.
- Effective planning, controlling and monitoring and therefore, better integration of the design process.
- Enough time for design improvements.

## **5.1 Conclusion**

The purpose of this research is to analyze the ERM framework adopted by the selected company in Qatar. ERM provides a method to apply continuous attention to risks that are prevalent throughout the corporate world. The goal is to mitigate risks in order to protect the interests of the enterprise and shareholders. Even though it is impossible to identify all potential risks, risk managers apply a methodology that provides flexibility and adaptability to adapt the basic framework. Moreover, the methodology will aid to suit the purposes and objectives of any project or endeavor while adhering to the guidelines and principles as established by upper management. An effective risk management policy will serve as the guideline to apply to all endeavors or projects as each project is unique and the risks vary accordingly. Hence, this will require the company to develop a plan that provides the flexibility necessary to be adaptable to most projects or endeavors that are initiated. This policy should be designed to adhere with the vision and values of the company while providing the most protection against threats as possible.

The Company's petrochemical business is potentially exposed to several kinds of risks, oil and gas industry specific risk, in addition to the business specific risks. The Company recognized that the effective management of the business risks is crucial to their continued growth and success. After the adoption of ERM framework, the company must create policies, procedure, and clear structure. Furthermore, the structure must decentralize responsibilities and accountabilities aimed at risk identification, assessment, treatment, and risk monitoring and reporting.

To conclude, the impact of this study revolves around how the selected company should handle risks and monitor the causes of risk rather than fixing failures. Consequently, by using different literature regarding ERM, this research lived up to the purpose of analyzing the ERM framework adopted by the selected company. The framework adjusted from the COSO framework (2004) of how a company can deal with risks by identifying, assessment, and treating risk with different level of severity to avoid failure.

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