

Research Title

**Impact of Risk Management Techniques on the
Financial aspects during Petrochemical Project
Planning**

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1. Introduction:

The Kingdom of Saudi Arabia is considered one of the first countries to export petrochemical products, as it relies on the production of crude oil and then refining it and converting it into oil derivatives and petrochemical products. It reflects significantly an upstream industry in which it aims to produce petrochemical products such as crude oil and gas from natural reservoir – and rely greatly on crude oil exports. Nevertheless, since the launch of the Saudi Vision 2030, the Saudi country seeks to produce more products in petrochemical field (Saudi Vision, 2030). In the KSA, the Saudi government stands all responsibilities related to promoting and developing standards and regulation of the industry and suggest punishment of those who are not adhering to these regulations. This means, the Saudi government presents the prosecution, judge and jury relating to all aspects of regulations and rules in the petrochemical industry in KSA (Aljohani,2021).

For several years, industrial enterprises in the petrochemical field have experienced changes toward enhancing operational effectivity. To achieve this objective, it requires project development execution, that are beneficial to these firms, in addition the public economic and result in social advantages. Planning development projects is a complicated operation that demands multi-purpose analysis, that should supply adequate information permitting decision making whether or not to execute a specific project.

These decisions consider the most challenges between all economic decisions. The attainment of benefits in dependent of planning requires planning to the future unexpected conditions of firm processes, identified by exterior and interior factors (Bijańska & Wodarski, 2014). These factors are often in exchanged dependency, in particular difficult owing to the industries of petrochemical, that is distinguished by the production operation complexity and the variety of technical and technological techniques. Up to now, there are not known techniques enable to identify precisely of future conditions under which such petrochemical companies will maintain and operate. The risk correlated is with a probability of not receiving scheduled advantages or incurring unintended damages can be termed as a danger) Wilimowska,2001), (Sierpińska and Jachna,2004).

Risk should be managed in specific in planning project stage to attain the expected advantages while droppings and damages are accurately controlled. The goal of this study is to provision risk-management model in planning stage that can be applied in the planning of petrochemical development project.

2. Problem Statement

Petrochemical industry considers one of the most leading fields in which it contributes to KSA's economic. The field also occupy a leading place compared to other countries of the Gulf Cooperation Council (GCC). GCC area provide approximately 16 % of the petrochemical outcomes in the world and the KSA alone generates almost % 60 percent of the GCC's whole petrochemical production. KSA occupy 11th largest petrochemicals provider in the world (Akhtar, & Asif, 2017).

Despite the great progress of Saudi petrochemical industries companies in the field of petrochemical industry, these petrochemical factories incur significant financial losses due to insufficient planning for projects related to the maintenance of machinery and equipment, unforeseen emergency circumstances that arise, and sudden malfunctions during the operation of the equipment, which causes delays in projects, which results in an increase in costs and poor production quality. Therefore, risk management during the development of a maintenance and operation plan for the production of petrochemical products is necessary to avoid any financial losses and obtain the best financial performance for the company.

3. Study Significance

This study is considered of great importance in the field of petrochemical industry management, especially in petrochemical equipment operation and maintenance projects. The importance of this study is that it aims to integrate risk management techniques in the stage of preparing the equipment maintenance and operation plan, which provides a plan that contributes to providing the applied side with foundations and principles to avoid any risks resulting from Maintenance of petrochemical equipment. This study is also unique in the academic field that integrates risk management during the planning of maintenance projects for petrochemical equipment and mechanisms in addition it can be considered as a basis for more research and improvements in this field.

4. Study Objective

The general goal of the study is to identify the impact of risk management techniques on financial project performance of projects in petrochemical industries in the field of operation and equipment maintenance. This general objective can be derived to the following sub-goals:

- 1- To evaluate the current, operation and maintenance plan in petrochemical companies in KSA and determine the challenge and limitations.
- 2- To integrate risk management techniques at project planning stage in petrochemical companies.
- 3- To study the impact of risk retention on financial project performance in KSA.
- 4- To detect how risk avoidance influence on financial performance of the projects in KSA.
- 5- To investigate the impact of risk control on financial performance of projects in KSA.
- 6- To Assess the impact of risk transfer on the financial performance of projects in KSA.

5. Research Questions:

- 1- What are the risks that impacts on maintenance and operation equipment during planning stage in petrochemical industries?
- 2- To what extent does risk retention impact the project's financial performance in KSA?
- 3- What is the impact of risk prevention on performance the project's financial performance in KSA?
- 4- How does risk control impact the project's financial performance in KSA?
- 5- What is the impact of risk transfer practice on the project's financial performance in KSA?

6. Study Hypothesis

- 1- There are challenges and defects in petrochemical equipment maintenance plans that cause poor financial performance of the maintenance Equipment Projects
- 2- There is a need to integrate risk management techniques during the planning stage of equipment maintenance and operation
- 3- There is no statistically significant effect at a significance level of less than 0.05 for the risk retention technique on the project's financial performance.
- 4- There is no statistically significant effect at a significance level of less than 0.05 for risk prevention technology on the financial performance of the project.
- 5- There is no statistically significant effect at a significance level of less than 0.05 for the risk control technique on the financial performance of the project.
- 6- There is no statistically significant impact at a significance level of less than 0.05 for the risk transfer technique on the project's financial performance.

7. Previous Studies:

Numerous studies in the field of study the impact of risk management on project performance have been executed:

Winarto & Chariri, (2022) carried out research to analyze the impact of company risk management on financial performance of the company. Those factors comprise danger committee, risk map, COSO and ISO guide.

This research is conducted using quantitative method. the study based on secondary data to gather via annual report, Bloomberg Finance Laboratories and IDX website utilizing purposive sampling method. The sample population targeted in this study industrial firms which were 74 firm. The gained data then were detected by utilizing regression analysis. The outcomes of the research point the results show that ISO framework positively impact the company financial performance

- (Alsaadi & Norhayatizakuan,2021) aimed to execute risk management in construction sector to guarantee to deliver the construction with high quality on time and within specific cost. and the study showed that integrating risk management enhance the construction project performance greatly and the study recommended to employ project managers who has adequate experience in risk management and its major schedules.

- Butt et al.,(2021) conducted study to prove that structured risk management technique via planning phase of the project is the optimal method. The study adopted quantitative technique The study has successfully attained its goal to define the influence of risk definition

the study showed that there is robust positive correlation between risk identification and performance of the project.

Bijańska, J., & Wodarski, K. (2014) executed a study to provide risk management model it used during the development project planning of industrial companies. The model comprises techniques of risk definition, measurement and assessment of danger. The model was generated based on several years of study of the challenges of planning and assessment of the efficiency and hazards of the development projects execution in industrial firms.

8. Theoretical principles of the study:

8.1 Enterprise Risk Management Theory

Nocco and Stulz (2006) defined Enterprise Risk Management (ERM) that is a theory of risk management motivators in order to suggest recommendations to measure and size of risk that can be noted encounter a given entity whole than the administer of each danger separately. It seeks basically is to integrate the hazard management silos in a company plan into one thorough framework. The ERM risk management guidance of administering danger confirms that senior firm executives and staff should actively be participate in hazard management process to analyze and respond to a comprehensive area of firm risks (Hallowell, Molenaar, & Fortunato, 2013). This principle motivates all the organization's members to be participated in the administer of dangers. Also, the ERM shed light on the significance of clear operation and regulations for administering dangers. Olson and Wu (2010) stated that the theory additionally confirms that if ten enterprises can adopt formal regulations that identify dangers appetite, strategic objectives, and structured operations then they can enhance their risk management ability of defining, analyzing, and handling of dangers. Moreover, the theory affirms on a developing of hazard management culture where all stakeholders are enabling and accountable to administer dangers. Cormican (2015) proposed that ERM practices involve increased competitive benefit, stakeholder confidence and sustainability of companies.

8.2 Risk Management Principle

Risk management (RM) is a principle that have become very common in several enterprises. Numerous firms often execute risk management in their projects to enhance financial performance and enhance profits in addition to enhance productivity (Ahmadi et al., 2017). Dangers and uncertainties consider of the most broadly utilized concepts in the literature of project management (Hopkinson, 2017; Qureshi et al., 2020)). Even though these definitions are significantly correlated, several writers characterize them (Lachapelle & Hundozi, 2018). It is also hard for labor at danger to determine and distinguish them. Risk management received great attention, as it considered as a technique to enhance cost, schedule, and technical performance of novel product improvement plans (Aven, 2016). Uncertainty is one of the most significant danger factors in projects that are as a random action of an action where the possibility is actually unknown, that means that the uncertainty is owing to the occurrence of a little-known event, except that it may occur. (Bazin, 2017). Nevertheless, it should be affirmed that risk management is not only an instrument that guarantee success but rather an instrument that assists to enhance the possibility of attaining success. (Ahmadi et al., 2017).

8.3 Risk Management Techniques

8.2.1 Risk Identification

Risk identification is important as it impacts the sequences steps of the organization's work (Petrovic 2017). Similarly, strategies should be improved that can define dangers to expect the probabilities of their occurrence, similarly to several strategies suitable for handling with hazards as soon as explored (Potts and Ankrah 2008). Mhetre et al. (2016) thinks that it can display the hazards that a firm was priorly subjected to, ranked by its demands, from the most serious to the least serious, that assists the firm's personnel with knowing these hazards and simplifying their identification.

Potts and Ankrah (2008) emphasized that this operation is the most important in risk management and has measures and methods for collecting information and executing an exact database to gain the best outcomes. Numerous approaches for defining dangers comprise brainstorming, holding workshops, analyzing scenarios, analyzing historical data, analyzing action plans (Klemetti 2006), and interviewing experts, that is the most useful method (Steyn 2018).

8.3.2 Risk Assessment

Saeidi et al. (2019) identified risk evaluation as “allowing a company to take into account the influence and probability of events and analyze danger utilizing quantitative and qualitative methods. It investigates the positive and adverse impacts of possible events all over the company. So, the second phase is the major strategy to investigate for analyzing and assessing dangers. Consequently, this operation aims to rank hazards (Rovins et al. 2015). Risk assessment is a high risk, and it should demand the management to run efficient tools to address efficiently these hazards. In addition, low risk should not be neglected, while, the quantity of control should be lower than for high dangers (Serpell et al. 2015).”

A—Qualitative method: It based on the utilization of interviews, brainstorming, the Delphi method, and checklists, the probability and impact of hazards can be used adversely or positively to a firm's objective and expected results (Banaitiene and Banaitis 2012). One of the qualitative methods for evaluation is a “risk matrix”, as illustrated in Figure 1, that can be based on to make a decision the “possibility of danger” (Serraino 2014), in which the hazards are categorized into three levels: high danger, medium danger, and low danger (Petrovic 2017)

		Impact →				
		Negligible	Minor	Moderate	Significant	Severe
Likelihood ↑	Very Likely	Low Med	Medium	Med Hi	High	High
	Likely	Low	Low Med	Medium	Med Hi	High
	Possible	Low	Low Med	Medium	Med Hi	Med Hi
	Unlikely	Low	Low Med	Low Med	Medium	Med Hi
	Very Unlikely	Low	Low	Low Med	Medium	Medium

Figure 1 Risk Matrix

Quantitative method is considered more unbiased than qualitative techniques. The quantitative method based on data to determine the level of impact of each danger (low, medium, or high) and the possibility of its occurrence, which is why it is an important operation to decide the level of impact of a hazard on the firm (Serpell et al. 2015).

8.3.3 Risk Response

It is the operation of defining the essential measures to reduce the negative effects of dangers on the performance of firms and avail the chances that improve their success. Alhassan (2016) pointed that it determines dangers via the optimal utilize of resources and activities in the cost. several techniques can be run to mitigate the possibility of risk severity and the impact of dangers.

According to Petrovic (2017), there are 4 techniques to respond risk: (1) avoiding dangers by efficiently handling with the cause, (2) mitigating the risks by reducing the cost of risk via using of emerging technology, (3) accepting the dangers, and (4) handling with dangers efficiently by planning an emergency case.

Figure 2 assists to make decision for the response to the possibility and impact of the risk based on two factors, the possibility of the danger and the danger effect, and the actions could be as follows:

-Avoid the risk; -Mitigate the risk.

-Transfer the risk; -Accept the risk.

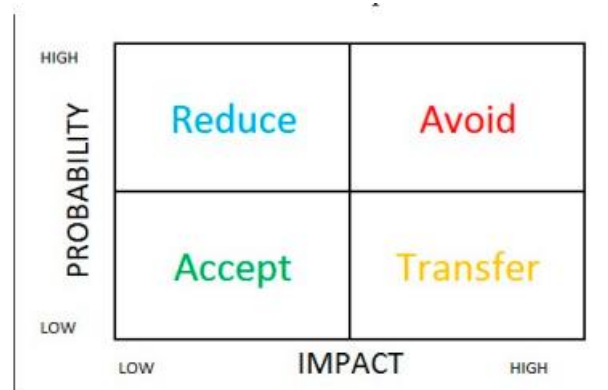


Figure 2. selecting risk reactions from kinds of risk control procedures

8.3.4 Risk Monitoring

PMI (2017) stated that risk monitoring and control is the “operation of tracking defined dangers, defining and analyzing novel dangers, monitoring the execution of risk reaction plans, and evaluating the efficient of risk management operations during a project life cycle”.

9. Methodology and Study Methods:

The descriptive approach will be adopted through quantitative analysis to achieve the objectives of the study, which is to verify the impact of integrating risk management during the equipment maintenance and operation plan phase on the financial performance of the project.

9.1 Study population

The study population includes employees of SANKYU Company in the field of maintenance and operation of equipment for the petrochemical industries, as the number of the company's employees for the year 2024 is 467 personnel comprise administrative employees, workers, supervisors, and project managers.

10. Study Tools

10.1 Study scale

A five-point Likert scale will be used to measure and evaluate the questionnaire items

10.2 Data collection:

A questionnaire will be used and distributed to a sample of SANKYU employees in the field of maintenance and operation of petrochemical equipment. The content of the questionnaire and the extent of its credibility will be verified by distributing it to experts in the field of risk management. Correlation analysis will also be conducted using the Pearson coefficient to ensure the validity of internal consistency, in addition to conducting a reliability analysis using Cronbach's Alpha coefficient

10.3 Statistical methods

- 1- Averages and standard deviations
- 2- Relative importance factor
- 3- Linear regression

10.4 Study Scope

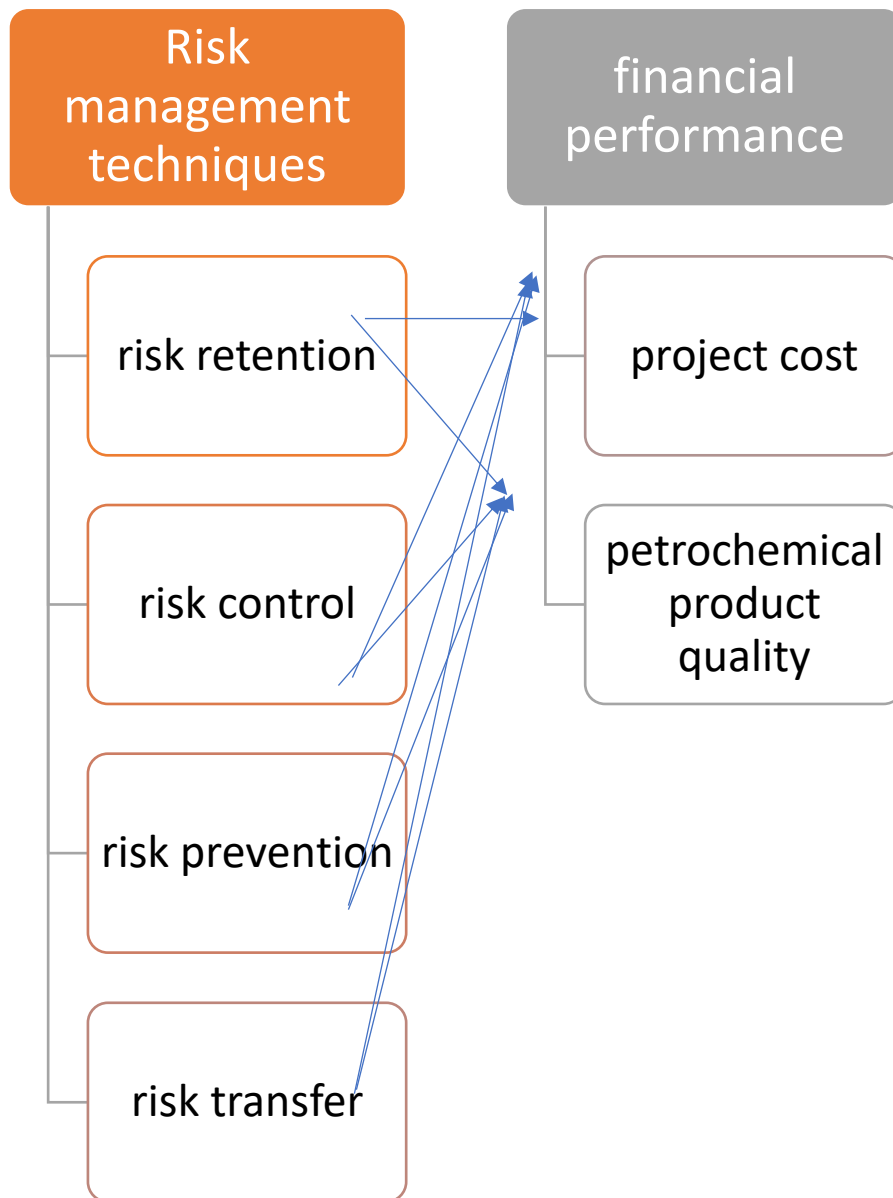
The boundaries of the study represent human, spatial and temporal boundaries

- 1- Spatial boundaries: The study will be limited to Sankyu Company for the maintenance and operation of petrochemical equipment
- 2- Time limits: The study will be conducted in the second semester of 2024
- 3- Human limitations: The study sample is limited to Sankyu employees in the field of manufacturing and maintenance

11. Dependent and Independent variables

Independent variables: retention risks, transfer risks, control risks and prevention risks

Dependent variables: project cost and petrochemical product quality



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