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The impact of the triangle (quality, cost, time) on projects management in the steel sector in Riyadh

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Declaration Certificate

The work entitled, ‘‘**The impact of the triangle (quality, cost, time) on projects management in the steel sector in Riyadh**’’, embodies the results of the original research work carried out by me in the College of Management, Department of Project Management Midocean University. This research work has not been submitted in part or full for the award of any other degree at Midocean or any other university.

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Dedication

Firstly, I would like to extend my sincere thanks and appreciation to the university administration and my professors who provided me with all kinds of support to enable me to carry out this research. I also particularly thank my professor PhD. Waleed Sulaiman and PhD. Alfaisal Abdelhameed of this research for the guidance he provided me so that I could complete the project successfully.

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Abstract

In this research, the impact of the triangle of quality, cost and time on project management in the steel sector in the industrial zone in Riyadh, the Kingdom of Saudi Arabia, is discussed. These three factors were chosen for their clear importance and their direct effects on project management.

In order for this research to be carried out in this way in application to the steel sector in the industrial zone in the city of Riyadh in the Kingdom of Saudi Arabia, it was necessary to rely on an appropriate tool for collecting data. The questionnaire tool was chosen as an appropriate tool to collect data regarding the impact of these three factors, namely quality, cost and time, on project management. The steel sector was chosen to apply the questionnaire in the city of Riyadh.

The data gathered from the questionnaire's application will also be analyzed using the SPSS statistical program, and the numerous statistical indicators required to ascertain the degree to which quality, cost, and time affect project management will be employed. subsequently deriving conclusions that may be applied to other fields, so helping academics, researchers, and project managers in a practical sense.

The impact of the triangle of quality, cost, and time on project management in the steel industry in the Riyadh industrial zone will be measured thanks to the significant findings of this research. Three aspects were given particular attention by the researcher throughout her evaluation of earlier studies on project management and its influencing factors: quality, money, and time.

CHAPTER 1

INTRODUCTION

1.1. General Introduction

The Urban renaissance and project development have benefited greatly from the application of one of the modern and advanced sciences, project management. The three most important factors that determine the path of construction must be considered in order to achieve the best possible form of construction. These factors are quality, time, and cost, together they have been dubbed the project management triangle due to their perceived influence.

In terms of what constitutes a project, one definition would be any work that has a defined beginning and end point and needs to be finished. It is a collection of tasks connected by reciprocal relationships in which a number of people collaborate to complete a given task within a set time frame (Al-Muzaini, 2020).

The project is finished within the allocated budget. When deciding whether or not to finish a project, evaluating its economic viability is thought to be crucial. The main factor that determines resources is cost. It is important to note that some businesses compete solely on the basis of cost, meaning that they differ in terms of high efficiency and resource optimization, whereas other businesses compete on the basis of quality and are distinguished by high capabilities geared toward excellence and innovation (Lazhar, 2019).

Project management has become widely used in business over the past few decades, having emerged from its origins in sectors like construction and defense. Today, it is a crucial component of many successful strategies across a wide range of industries, most notably the service sector. Numerous studies have been conducted to investigate a wide range of factors that impact project management, thereby attesting to the growing significance of project management (Kádárová, 2019).

Cost behavior is valuable in predicting future cost when creating budgets or planning future activities such as production or projects. Some activities affect cost in different ways, as it has been discovered that a fixed setup cost and a variable machine time cost for making prototypes can result in very different costs than originally anticipated (Kádárová, 2019).

1.2. Research Questions

All contractual projects are supported, according to the 2030 Plan report, which attests to the assistance provided to the Kingdom of Saudi Arabia's government in carrying out its initiatives. The government of Saudi Arabia is pushing the private sector to implement processes that can expedite project completion and lower costs, and the Kingdom is making great efforts to implement projects across the country in line with the 2030 Plan, which King Salman approved.

To enhance performance efficiency, which is shown in project execution, the Saudi government also keeps an eye on the project schedule and encourages the private sector to expedite project completion. These steps, however, won't cut costs, speed up project completion, or enhance project quality on their own.

The problem of the study was crystallized after reviewing a number of studies regarding project management in the Kingdom of Saudi Arabia, where the researcher found that there are a group of factors that led to project management not fully achieving its goals. These factors represented a noticeable decline in the level of quality, due to the speed in completing project implementation. In a way that affects quality, or increases the cost beyond the planned level due to the desire to implement the project at the agreed upon time.

In addition, the business planning and implementation of these projects was incomplete and inaccurate, there was a clear lack of effort expended, and there was little innovation to reach the required efficiency in quality level, all of which had a negative impact on the level of projects in the Kingdom of Saudi Arabia.

The research' drawbacks revealed that, in addition to the projects' failure to meet the required quality standard, there were issues with considerable time waste, indicating that time management did not meet objectives. Moreover, poor project planning resulted in a large rise in project budget expenses. Additionally, a lackluster project prioritization has limited the projects' benefits.

What is the effect of the triangle of quality, cost and time on project management in steel sector in Riyadh?

Regarding the main question, the research can exclude the following sub-questions:

1. What is the impact of the quality factor on project management in steel sector in Riyadh?
2. What is the impact of the cost factor on project management in steel sector in Riyadh?
3. What is the impact of the time factor on project management in steel sector in Riyadh?

1.3. Research Objectives

This research aims to achieve the following objectives:

1. Evaluate the impact of these three factors on project management in general.
2. Clarify the impact of strict quality standards on project timelines, budgets, and overall success in Riyadh's steel sector.
3. Distinguishing between the three study variables and clarifying their impact on project management.
4. Investigate the connection between timely project completion, scheduling accuracy, and the cost-effectiveness of steel construction projects in Riyadh.
5. Generate data-driven recommendations for optimizing quality, cost, and time management in Riyadh's steel sector to improve project outcomes.

1.4. Significance of the Study

This research is important from different perspectives, as follows:

1. **Theoretical Importance:** This research will help enrich the scientific library, and is considered an additional resource that researchers can benefit from during their research. Moreover, it will contribute to the literature in different ways because after reviewing the literature, it was shown that there is little research that examines the impact of quality, cost and time as factors combined in one research and their impact

on project management, specifically in steel sector in the industrial area of Riyadh, in the Kingdom of Saudi Arabia. This research will be considered an important reference in the factors affecting project management and understanding how to improve levels of quality, cost and time.

2. **Practical Importance:** This research will enable steel sector in the Kingdom of Saudi Arabia to better deal with quality, cost and time factors in project management, and to adopt effective strategies to improve the levels of these factors. This will enable those responsible for project management to perform better, increase the level of quality, reduce the level of cost, and reduce time as well. Aside from the benefit related to the recommendations of this research, the general public will benefit from the study by improving the handling of quality, cost and time. This will also lead to the ability to complete projects effectively and efficiently. This study will also be useful to the government in developing regulations related to how to manage projects. Government projects as well, and preserving the Kingdom's resources necessary to implement various projects. Also, highlight how the research aligns with Saudi Arabia's 2030 Vision to underscore its practical relevance and contribution to broader societal goals.

Finally, the researcher hopes that this study will contribute to increasing his scientific and practical knowledge. This research is also a basic requirement for obtaining a master's degree in project management.

1.4.1. Managerial Relevance

The factors quality, cost, and time in project management in the steel sector in Riyadh contribute to the speed and accuracy of project completion and facilitating the means of completing them. Therefore, decision makers must know these influences on the part of quality, cost, time, and the factors affecting them accurately to achieve these goals. Managers must allow knowledge of such research because it contains valuable information that they can benefit from in the practical field.

1.4.2. Scientific Relevance

The issue of the impact of quality, cost, and time on project management is one of the important topics at the scientific level, which receives the thought and attention of a large number of researchers and academics because of the clear link between practical problems and the research and studies that are carried out in universities, because the basic role of the university is to solve practical problems in a way Scientific and systematic, which necessitated choosing the research topic from the topics that concern practitioners in companies regarding project management.

CHAPTER 2

REVIEW OF LITERATURE

Introduction:

Nowadays, the capacity to successfully define and manage projects has become critical for all sorts of businesses. The project is a tool for the business to achieve certain goals outlined in its strategy.

The organization's long-term development through initiatives in the context of change is linked to concentrating on the business viewpoint in order to get better results.

The use of a variety of strategic tools as a strategic strategy for project selection, strategic planning, and project evaluation helps ensure the effective development and implementation of projects.

Projects are focused attempts that have time and resource constraints. Effective initiatives, from the perspective of an organization, are often those that provide measurements and possible solutions to challenges that the organization faces.

They may either supply the company with tools for developing novel goods or services, or they could uncover ways to improve present practices in the unique context and resources available. An organization's projects must be tightly tied to its overall strategy.

A strategic approach to project selection, a multi-stage process of project evaluation and prioritization, and regular assessments of the alignment between project portfolio management and the organization's business strategy are just a few of the strategic tools that must be employed in the course of project portfolio management in order to achieve the organization's strategic priorities.

The project portfolio management process is driven by the business strategy that the organization has chosen. This includes managing the organization's limited resources, establishing and prioritizing projects, maintaining a good balance and combination of projects, and aligning the projects with the business strategy.

The business world is becoming increasingly competitive. To remain competitive in the corporate sector, business decision-makers are modifying their approach. Many popular strategic concepts for the development of new business models have been established over the last few decades.

2.1. According to the Quality, Cost and Time

Quality

Total quality management is a new method and management philosophy based on fostering a culture of continual improvement in an organization's total performance.

It is practiced and applied by the organization in all of its internal and external activities and operations with the goal of achieving the highest level of satisfaction among its customers by satisfying their needs and desires in accordance with what they expect and ensuring the provision of the highest quality in its outputs (goods and services) at the lowest cost, shortest time, and least effort (Timan Idris,2022).

Because there is no single agreed-upon worldwide definition of overall quality management, definitions have changed and evolved. The following is a presentation of a group of definitions that address this subject in order to clarify and define its dimensions as well as its intellectual and philosophical basis.

According to Amr Aqili (2018), it is a modern administrative philosophy which takes the form of a comprehensive administrative approach or system, based on bringing about radical positive changes to everything within the organization, such as thought, behavior, values, organizational beliefs, administrative concepts, and procedures systems.

Work and performance, with the goal of improving and developing all components of the organization to achieve the highest quality in its outputs (goods and services) at the lowest cost, with the goal of accomplishing the highest degree of satisfaction among its customers by satisfying their requirements and wants in accordance with what they expect.

According to Al-Azzawi (2019), it is an inherent and comprehensive doctrine or custom in an organization's leadership and operating style with the goal of constant enhancement in long-term performance by focusing on the needs and expectations of customers while not neglecting the needs and expectations of shareholders and all other stakeholders.

Total quality management, according to Jad Al-Rab (2022), focuses on the overall and comprehensive control of the organization in light of the approaches of (constant improvement,

customer orientation, commitment of all employees to the quality ideology, and organizational culture).

Organizations are today experiencing numerous issues, the most significant of that is the increasing intensity of competition and the resulting change in customer behavior, which has grown more aware and capable of selecting the best product or service after embracing quality as a standard.

The latter has gotten more attention, and everyone is trying to please him and meet his needs where he stops. It is vital for the organization's life and continuity, and this necessitates that organizations have complete quality as the foundation for their goods and services (Abdul Salam Tabib,2019).

The quality assurance approach can be described as a system based on preventing the occurrence of errors (defect zero), that works to improve the quality of the product or service and increase productivity through putting assurances on the product, designing processes and monitoring them through focusing on the sources of activities and thus directing attention to the methods represented by what is known as quality assurance.

Quality Assurance encompasses a broader range of methodologies given that it focuses on product design, support, product use, equipment and supplier selection, decision-making, and organization.

Through its function in attaining economic development, the construction sector plays a vital role in serving the national economy.

And creating job opportunities, because the Population Sector Investors Association in Jordan is one of the main bodies working in this sector, which necessitates its members researching every aspect that would improve the efficiency of the projects which they are implementing, because it has a positive effect on the costs associated with those projects, the length of their implementation, as well as their quality, which will have an impact positively on the opportunities for employment (Feras Ali Khalefh Alzubi,2019).

Projects add value and capabilities to organizations and the people who benefit from their outcomes, and they have to be managed by implementing quality processes to ensure compliance with plans, activities, and applicable standards, as well as achieving the established demands and objectives in an efficient and effective manner.

According to ISO 9000, quality is the "degree that a set of inherent characteristics of an object fulfills requirements," and the objective of quality management is to "increase the likelihood that outputs are fit for purpose or use." Quality should be incorporated into the project's plan.

Quality management entails defining quality requirements with acceptance criteria and methods of verification and validation, standards to be utilized, and project deliverables such as internal, external, interim, final, tangible, and intangible outputs."

Managing project quality entails creating a quality management plan as well as defining quality policies, methods, and goals that can be met by quality planning, quality control, quality assurance, and quality improvement (António Rocha,2023).

To meet customer needs and give greater value to customers, construction organizations must support TQM activities in their operations, quality understanding, and responses. Several studies have demonstrated that TQM can provide a strategic and competitive advantage by increasing construction sector productivity and efficiency.

TQM-compliant organizations obtain a strategic market advantage over their competitors. TQM begins at the top; consequently, if the company's senior management have a more quality-oriented perspective, the employees will demonstrate superior workmanship and higher quality-oriented work (Hassan Riaz,2023).

The legislative uncertainties, technical ambiguities, and uncertainties (see Table 4) indicated the level of novelty of the building project, which provided obstacles to QM.

In terms of regulatory ambiguity, some essential specifications and norms of practice were still in the works. For example, no well-established grouting inspection methods had yet been developed for PC requirements. The construction quality inspection department was really concerned about this (Yan Ning,2021).

TQM application in the construction business can result in an increase in organizational standing, increased market share, and increased client satisfaction. Furthermore, construction TQM creates a favorable work environment in which all employees are engaged in achieving construction quality performance, focusing on customer happiness, and striving to improve the overall effectiveness and efficacy of construction projects.

The Kingdom of Saudi Arabia (KSA) has launched a few IS-related initiatives, primarily in the electrical industry. Yet, the role of IS in Saudi businesses remains limited, and there is tremendous room for improvement in key sectors like as oil and gas, petrochemicals, iron and steel, power generation, desalination, cement, and paper and pulp.

A plan of action for IS implementation is also created by taking into account the enablers and barriers and describing the framework, first stages, and policy levels. Nevertheless, in order to implement IS activities in the Kingdom of Saudi Arabia, technological, economic, and legal barriers must be addressed, and enablers should be strengthened in order to save resources, reduce environmental consequences, and increase social well-being (Zaid Ahsan Khan,2023).

Concerning Saudi Arabia, the country's growing population implies that achieving a de carbonized building environment is critical to ensuring environmental sustainability. Many countries are developing strategic approaches and putting in place various processes, protocols, and frameworks to improve the efficiency of their engineering structures.

Saudi Arabia's Vision 2030 strategic plan approves vastly higher standards across the board. Other governments, on the other hand, are simply concerned with de carbonizing their economies without taking into account other factors such as enhancing residents' quality of life, public investment, industrial development, logistics, and more (Mohammad S.M. Almulhim,2023).

Cost

Cost is one of the most important critical aspects influencing construction performance, and it must be managed and controlled throughout the life cycle of a construction project. As a result, cost control is critical in building projects to assure project success.

Cost management is one of the most important success criteria in construction projects, and it should be managed and controlled throughout the project's lifecycle.

The study focused on evaluating cost management practices in large construction projects in Riyadh, and the results revealed that the most effective methods for cost management were: cash flow forecasting, tender budgeting/estimating, and element cost planning.

Cost overruns are the most common problem encountered in building projects, affecting project cost management in many countries.

Cost management is an important stage in the life cycle of a construction project; construction projects require cost management in the first stage to complete the project within the required cost, time, and quality; it is regarded as one of the most important factors influencing the accomplishment of construction projects in all developing and developed countries.

Because cost is an important attribute in building projects, many researchers focused on examining the elements influencing cost performance in construction projects in various nations (A M Faten Albtouch,2020).

The project is regarded a success when it is completed within the specified cost and time frame while maintaining the required quality. The three items (cost, time, and quality) are interdependent; any change in one impacts the other, regardless the effect is good or negative.

Cost is a measurement of the resources required to get an object or execute an activity. The cost of an object is frequently expressed in monetary terms, such as employee time; the materials used to make the product could be represented by their value in dollars (Jaroslava Kádárová,2019).

One sign of project success is how well we carry out the project according to cost estimation while simultaneously providing the best financial advantage to the contractor. The current situation is that there are numerous issues related to the failure of a construction project as a result of schedule delays and cost overruns.

This issue has become more common in construction projects as a result of contractors and project owners failing to follow the proper management technique, resulting in project delays and cost overruns. Understanding the causes of cost overruns and categorizing the appropriate project cost management factors has now been a focus of this research (Manlian Ronald A. Simanjuntak,2018).

Because a project is a time-limited activity with limited resources such as cost, materials, equipment, and people, it necessitates good project management from feasibility research through planning preparation, procurement process, construction implementation, and operating process.

Stronger and more integrated project management and control systems will be required when a project gets more complex and it is found that there are not as many resources as there are.

Project cost management is the professional ability and knowledge to plan and manage a building project's expenses as well as identify possible hazards that can drive up construction prices.

Project management has changed over the last few decades, from being used in the defense and construction industries to becoming a crucial component of all commercial endeavors.

Project management is crucial to many industries, especially the service sector, as it is the cornerstone of an effective strategy. To support the increasing significance of project management in the twenty-first century, several well-known professional organizations, such as the Project Management Institute, were founded and are currently flourishing.

Clients place a high value on cost performance in building construction projects. Every project necessitates an estimated cost, which serves as the foundation for cost control and cost performance monitoring.

Construction projects involve numerous activities, each of which has its own cost. Most construction projects have cost overruns and hence exceed the initial contract estimate. Simply put, it becomes impossible to accomplish tasks within the budgetary constraints.

The most cost-effective aspects should be identified and considered when developing a strategy or plan to execute effective construction projects (Benjamin Akomah,2020).

It might be difficult to estimate and manage project costs efficiently whenever it comes to cost control in project management. Indeed, there is news every day concerning building projects running over budget and over schedule, but this is avoided with careful cost management.

Project cost management establishes the starting point for project expenses. Effective cost management guarantees that a project's budget stays on track and that it is completed within the scope that was originally planned.

A corporation can quickly lose money if costs are not controlled, and costs can exceed project profit. In building projects, there are two categories of expenses: direct and indirect costs (Janno Soon,2019).

Overruns on projects can significantly reduce margins and profit. It is critical to pay attention to beginning preparation in order to minimize and prevent such dangers. This role can be exceedingly challenging because it requires a complete understanding of everything related to construction projects.

Another strategy to cut project expenses is to identify work phases which may be completed with less money or with less expensive resources. Furthermore, like we all know, time is money, therefore shortening a project time frame will clearly aid to lower project expenditures.

The cost of a project is a significant factor for all project stakeholders; it is the primary concern for the majority of construction clients. Before beginning any project, clients are going to desire to understand their financial commitment. This brings them to the quantity surveyor, whose primary responsibility it is to forecast the expected cost of building works and manage them so that the client's agreed budget isn't exceeded (Cunningham, 2019).

Cost Strategic Management, in turn, is concerned with cost management, whether for product financial and profitability assessments or for verifying and assessing short and long-term firm profitability.

To achieve these goals, efficient and effective cost management is required, and it should be linked with business strategy to create a lasting competitive edge. Strategic cost management also helps greatly to efficiency in analyzing value for stakeholders, possible changes in organizational behavior, and risk reduction for the company.

The need of accurate cost estimating is critical for both the client and the contractor. Estimates that are reasonably accurate are critical to the initial choice on whether or not to proceed with the project, also known as the "go/no go" decision (Harrison, H.L. 1990:80).

The cost estimator evaluates the causes of change in the final estimate in order to better manage the project. It comprises projecting the cost of delivering project deliverables. The expense plan must be 'time-phased' once it has been authorized. As a result, a project cost plan is a time-phased expenditure plan that represents the total of all project expenditures, including direct and indirect (HARRISON NJAMU,2018).

Effective cost management of construction projects is a typical issue in the construction industry. It is one of the areas on which the contractor should concentrate while attempting to handle its project portfolio (Teja, 2020). Cost management practices entail making every effort to ensure that construction projects are completed within budget (Kim, 2022).

This is reinforced by the submission of Phanse et al. (2021), who argue that cost overruns arise when project management is inadequate to adequately oversee project activities and processes from start to finish (Reuben A. Okereke, 2022).

Project budgeting is typically done during the early stages of project planning and in tandem with the development of the project timeline. The budgeting procedures are heavily reliant on both the projected lengths of jobs and the resources assigned to the project.

Budgeting is a control tool that allows actual costs to be compared to and evaluated against the budget. The budget is frequently a fairly fixed parameter in project execution (SOLOMON BERHANU, 2019).

Cost management is understanding how and why expenditures are incurred on a project and taking important steps to guarantee that the project budget is not exceeded. The advantages of good project cost management that have piqued the interest of clients (both public and private) are its capacity to ensure enhanced value for money and client satisfaction (Gopalan and Venkataraman, 2018; Obi et al., 2017; Smith, 2019).

Time

Time plays an important role in all administrations that require rationalizing behavior and using available tools and abilities to complete tasks within specified dates, with motivation being one of the main components in the work system that enhances personality development, drives behavior, motivation, and also directs people towards a certain point of view.

Time is a key factor in the system of character development, behavior motivation, and steering toward a particular point of view when it comes to motivation.

The importance of sustenance aims at good organization that may include the attributes which assign the importance to time in organizing, based on the tendency to great cooperation among group members and an awareness of collective responsibility, as well as organizing work across group members.

Construction projects have an impact on people's daily life because they supply all physical locations and systems for living, working, and travelling. On-time completion is an essential component of success in controlling and assessing a construction project's performance.

As a result, good scheduling is critical for planning and controlling multiple processes and time-sensitive events in a construction project. Several scheduling strategies, including as bar charts, Gantt charts, network-based methods like the Critical Path Method (CPM), and simulation-based scheduling tools, have been developed in recent decades.

A time-space conflict occurs when the required workspace for both activities, which are partially or wholly performing concurrently, collide (Mohammad Saleh Dashti,2021).

Due to the demands of present and continually expanding markets, numerous approaches and tools for project management have been developed over time.

The Project Management Body of Knowledge (PMBOK); ISO 21502:2020 - Project, programme, and portfolio management — Guidance on project management; and Scrum are some of the most important approaches that the bulk of the industry has used.

The PMBOK is a collection of best practices in project management compiled by industry experts and organized by PMI.

It is regarded as the most comprehensive project management document, and it is organized into ten areas of knowledge (integration, scope, Schedule, cost, quality, resource, communication, risk, procurement, and stakeholder) that are handled within five macro processes (initiating, planning, executing, monitoring and controlling, and closing) (José Silva,2022).

The effect of time management, that constitutes one of the most important influences within governmental and nongovernmental institutions and organizations, given that time management is one of the foundations through which organizations of all kinds can advance, because time

management is one of the requirements upon which those institutions' and access' success strategy is built.

To administrative creativity within service institutions that are attempting to find faster and more accurate ways of functioning in order to increase organizational skills and development (Wiam Wahab,2020).

In the literature on PS, there is at least one agreement: overall success ought to be viewed from two separate perspectives. However, PMS is regarded the project manager's responsibility and entails delivering project outputs on schedule, within budget, along with the necessary capabilities and functions. As a result, it is typically measured using the triangle of iron (time, budget, and scope/quality) (Otávio Próspero Sanchez,2018).

IS Delivering or upgrading products and services which aid in the achievement of an organization's strategic goals is what project execution comprises.

As a result, project success is critical and typically justifies the large organizational investment. Considering the efforts of the academic and practical worlds, project success remains low. Although general project failure factors have been discovered (PMI, 2017), they're rarely researched together and interconnected.

We classified the elements that impact PMS in organizations into four levels in our study: the first, Portfolio Network-Level Effects, including project network proximity and project network eigenvector.

Given the need to develop project and programme management in order to achieve organizational performance (Martinsuo and Hoverfält, 2017), the literature outlines numerous unique characteristics that projects might take on and that should be addressed while analyzing CTPMS. Project size, project duration, project postponement, and project outsourcing level were all factors examined.

In a similar way Taylor et al. (2012) contend that large projects are more difficult and risky; such initiatives necessitate larger teams and improved communication, resulting in increased organizational complexity and a lower likelihood of success.

As a result, dividing large projects into smaller sub-projects can minimize complexity, mitigate risks, and boost chances of success.

Leaders of projects should be able to convince others to act in order to accomplish the project's objectives in order to motivate people. However, in order to produce successful economic results, leaders must also establish a culture in which individuals feel empowered and motivated by a common objective (DuBois et al., 2018).

For project management success, however, the project manager must possess not only the soft skills required to drive team member contributions, but also the hard skills (tools and procedures) required to monitor and supervise project operations (Singh and Tan, 2020).

To improve project performance, projects must be completed by small teams, and developers ought to be assigned to a small number of project teams. This method additionally reduces the fact that team member allocation ideally requires persons with different skills, yet such specialists are expensive to hire (Walter and Zimmermann, 2016).

The planning, organization, monitoring, and management of all components of a project, as well as the motivation of all parties involved in order to achieve project objectives safely and under agreed-upon time, cost, and performance requirements. The project manager is the primary point of contact for accomplishing this (Roger Atkinson, 2020).

Other definitions have been proposed. Reiss suggests that a project is a human activity which accomplishes a clear objective against a time frame, and that project management is a combination of management, planning, and change management to accomplish that whereas leading to that a simple description is not possible.

While other proposals have been made regarding what project management is, the success criteria, namely money, time, and quality, remain and are contained in the real description.

Efficient time-space planning necessitates an examination of changes in space requirements in primary and process-level activities. Network-based scheduling systems, on the other hand, do not take process-level activities into account when scheduling construction operations.

As a result of adopting network-based scheduling, most previous research has ignored time-space conflicts in process-level operations. Because network-based scheduling algorithms are unable to consider process-level activities, they cannot appropriately consider cyclic activities (Mohammad Saleh Dashti,2021).

Space is a basic concept in the time-space conflict management field of study. Building elements, temporary facilities, materials, equipment, machinery, and humans all occupy space on a construction site. The first stage in resolving time space conflicts is determining which spaces are permitted on a construction site.

The development of these taxonomies improves the visual perception of site needs for space and establishes the groundwork for time-space conflict analysis.

When the system identifies a time-space conflict, it examines it and decides how to resolve it automatically.

As previously stated, the proposed approach creates all of the site spaces and separates them into several sub-cuboids before starting the project simulations.

When the system identifies a collision involving two site spaces, it calculates their collided percentages by multiplying the total number of cuboids by the number of collided cuboids.

2.2. According to the Project Management

Kim and Mauborgne (2019a) introduced a new business strategy called "Blue Ocean Strategy" in this manner, which quickly attracted worldwide attention and acceptance.

With the tireless efforts of Kim and Mauborgne, BOS, a unique method for obtaining success through market analysis, gained widespread adoption by many organizations (Samsul Alam, 2023).

BOS, or value innovation management, is a strategy which redefines the strategic problem away from competition and presents a series of ways that maximize potential while minimizing risk (Leavy, 2020).

There are two types of strategies: structuralist (red ocean), which assumes that the operating environment is given, and reconstructionist (blue ocean), which assumes that the environment can be shaped.

Which one is most suitable relies on the environmental attractiveness, the abilities of the organization, and whether or not there is a strategic orientation for competing or innovating.

The strategy known as the Blue Ocean Strategy (W. Chan Kim, Renée Mauborgne) approaches this issue in an entirely new and distinct manner.

That strategy is an ongoing trend with strategic thinking, focusing on the creation of new industries and markets in which, instead of war and struggle for buyer appropriation, new demands emerge and competition law is rendered meaningless (Meysam Jafari Eskandari, Meysam Miri, Allahyar Allahyary).

Rather than competing in a market, Kim and Mauborgne argue that it is always better to establish a market with no competitors and control it (Mona N. Shah, 2023).

As a result of this, in order to produce a blue ocean, creativity is required. It is critical for the success of a project-based organization to select an appropriate project at the proper time. This conclusion is the result of smart brainstorming.

As many business administration literatures have confirmed, the importance of efficient organizational performance in institutions and the extent of its impact on project management is considered as one of the most prominent administrative topics addressed by management scholars in the modern era.

And management's ability to plan the task and put up the required effort to see it through to completion. Projects and work on creativity and innovation will help to achieve efficient organizational performance, which is regarded as the cornerstone for institutions seeking to compete and expand (Sherif Ibrahim Desouki, 2021).

In assigning and accepting numerous projects, as well as boosting organizational performance through the crucial role it plays in organizations requiring certain standards of quality, which to the regulations and processes in place in the founder in addition to organizational culture and its

role in determining how employees interact inside the organization in order to maximize efficiency, coming soon Performance: It refers to the common behavior of employees or between employees and bosses.

In other words, organizational culture aids in the identification of values. The organizational norms that prevail in those institutions, as well as the organizational norms that emerge among workers.

The implementation of knowledge, skills, tools, and procedures to project activities in order to achieve project requirements is referred to as project management.

Project managers must aim not just to accomplish specified project scope, schedule, cost, and quality targets, but also to simplify the entire process in order to meet the requirements and expectations of persons involved in or affected by project activities.

Project managers perform a significant role in the success of projects and, by extension, organizations. Project managers collaborate with project sponsors, project teams, and additional stakeholders to achieve project objectives.

They also collaborate with sponsors to determine success for specific projects. A good project manager does not presume that their notion of success is identical to that of the sponsors (Mahmoud Saeed Saif,2023).

2.3. Hypothesis

Based on the research framework, the main hypotheses can be formulated and moreover, three sub-hypotheses can be extracted based on each variable on Project Management: -

H1: There is a statistically significant impact at level $\alpha \leq 0.05$ of triangle of quality, cost and time on project management in the steel sector in Riyadh.

The main hypothesis is divided into the following sub-hypotheses: -

H1.1: There is a statistically significant impact at level $\alpha \leq 0.05$ of quality on project management in the steel sector in Riyadh.

H1.2: There is a statistically significant impact at level $\alpha \leq 0.05$ of cost on project management in the steel sector in Riyadh.

H1.3: There is a statistically significant impact at level $\alpha \leq 0.05$ of time on project management in the steel sector in Riyadh.

CHAPTER 3

THE METHODOLOGY

3. In this chapter, the research process for the thesis will be well defined and described sequentially. Where the preparation of the research and the methodology used in the research will begin; The survey process that was conducted through applying the questionnaire will also be discussed. As for the research design and the number of participants, a summary will be presented to them in the next chapter. The procedures for sampling and designing the survey will also be presented, how to determine the sample size, and the research tool used, which is the questionnaire. Finally, the survey will be presented. The method that will be used in statistical analysis.

3.1. Research Approach

The researcher presents the research methodology used in this thesis, which means the plan and procedures that consist of steps and assumptions regarding the method used to collect, analyze and interpret data. Therefore, the researcher will depend on the nature of the research problem being addressed, which is related to the impact of quality, cost and time on project management in the steel sector in Riyadh.

3.2. Research Design

Research design represents the detailed plan of the research project. Research methodology refers to the standard set of tools, techniques and methods used for the purpose of collecting, analyzing and interpreting data by the researcher. Therefore, research design is the method through which these methods are linked together to address questions related to the research in order to Arriving at conclusions that can be generalized. Modifying the appropriate research design is also crucial to achieving the objectives of the research project.

Research Variables:

The research seeks to reach its objectives through the following variables:

1. Independent Variable:

1.1. Quality.

1.2. Cost.

1.3. Time.

2. Dependent Variable: Project Management.

Research Model:

Based on the literature review, the research model can be developed to link the impact of s. Figure 1 below shows the correlation between independent variables and dependent variable.

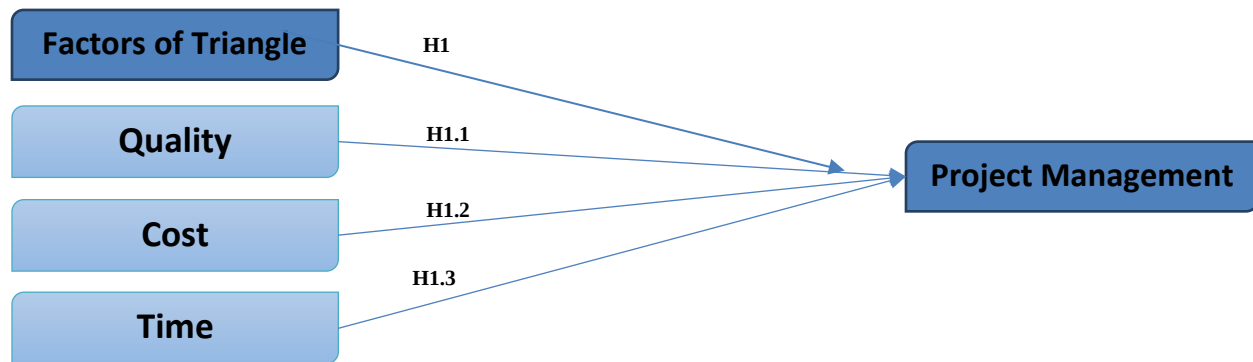


Figure 1: Study Model

Source: Developed by the Researcher

Methodology and research methods:

Quantitative research employs the descriptive analytical method, which describes the phenomenon and looks for patterns in the data to answer questions about who, what, where, when, and to what extent, because it is the process of gathering, analyzing, interpreting, and presenting study results. Because it presents the known information in a way that is pertinent to the research question about capabilities, requirements, technologies, activities, regulations, people, and contexts, it is also regarded as fundamental to practically every research project.

The quantitative method used in this study is predicated on the statistical interpretation of phenomena in order to arrive at rational solutions for the study's problem. The impact of the triangle of quality, cost, and time on project management in steel sector in the Riyadh industrial zone is described and analyzed in this study using a descriptive and analytical approach. It should be mentioned that the descriptive approach helps to describe events and phenomena in order to determine the underlying causes of their emergence as well as the possibility of describing them

and coming up with workable solutions for them. The primary tool used by the researcher will be SPSS, along with the survey.

Study tools (data collection tools):

Design: This study uses a quantitative approach to analyze the impact of the quality, cost, and time triangle on project management in Riyadh's steel sector.

Data Collection: A survey will be conducted with 200 participants, including project managers and stakeholders. The survey uses a 5-point Likert scale to measure quality, cost, time, and project management.

Analysis: Data will be analyzed using SPSS software. Multiple regression analysis will determine the relationships between quality, cost, time, and project management.

Ethics: Informed consent will be obtained from participants, and data privacy will be ensured throughout.

Validation: The survey instrument will be tested through validity and reliability indicators of the questionnaire through SPSS to verify the validity and reliability of the data.

Conclusion: This methodology will provide valuable insights into the relationships within the quality, cost, and time triangle in project management in Riyadh's steel sector.

Statistical Analysis Tools:

SPSS will be used to analyze the questionnaire, and the following statistical instruments will be used:

1. **Frequency and Descriptive Analysis:** To ascertain the mean, mode, and median—the three measures of central tendency. The researcher can assess the outcomes with the aid of these metrics.
2. **Cronbach's Alpha for Reliability Statistics:** To assess the questionnaire's reliability and make sure it accurately measures the intended objectives.
3. **Pearson Correlation Coefficient for Validity:** This coefficient assesses how well two variables are correlated.
4. **One-sample T-test:** To assess how well the sample mean matches a predetermined value. It needs independent, normally distributed data, and a random sample.

5. **Separate Samples T-test:** Used with two independent samples and when the population mean is unknown to ascertain the differences between two sets of data.
6. **Analysis of Variance (ANOVA):** To ascertain the differences between multiple variables, compare their means. Determining whether to accept or reject the null hypothesis is helpful.
7. **Multiple Linear Regression Model:** To elucidate the correlation between the dependent variable and a number of the independent research variables.

Fields of study (human, spatial, temporal):

1. **Locational Limits:** This research will cover all the steel sector in industrial zone in Riyadh.
2. **Time Limits:** This research will address the period between Oct 2023 and Nov 2023.
3. **Objective Limits:** This research will be limited to knowing the impact of Quality, Cost and Time on the Project Management in industrial zone in Riyadh.

CHAPTER 4

ANALYSIS AND RESULTS

4.1 Procedures of data analysis

The researcher performed the following procedures to complete the statistical analysis of research:

a) Data Entry and Processing

The questionnaire forms were reviewed to ensure that they were complete and suitable for data entry and statistical analysis, and non-compliant or incomplete forms were excluded, then the data was encoded, and then entered into the statistical package (SPSS) to extract tables and figures that help present the results this search.

b) Descriptive Statistics: The researcher extracted the descriptive statistics for the study variables; the descriptive statistics is dealing with frequencies tables and percent, mean, standard deviation, Coefficient of variation, descriptive statistics ranking.

c) Answering the research questions: According to the criteria for the approval and disapproval in the framework of Likert scale Pentagonagram used in this research. Most of the studies point to categories weighted average according to the criteria for the agreement and disagreement in the context of Likert scale, which is used in this research, as follows:

Table (1) Likert scale

scale	interval
1 – 1.80	Strongly disagree
1.81 – 2.60	Disagree
2.61 – 3.30	Neutral
3.31 – 4.20	Agree
4.21 – 5	Strongly agree

4.2 Methods of data analysis

The researcher performed the following methods to complete the statistical analysis of research: -

1. Descriptive statistic; frequencies tables and percentages, mean, standard deviation, coefficient of variation, ranking.
2. Graphs showing the study's main variables.
3. Correlation matrix spearman of the Axis of the study “The impact of the triangle (quality, cost, time) on project management in the steel sector in Riyadh”, triangle (quality, cost, time) are the independent Variable X, and project management is the dependent variable Y).
4. Alpha Cronbach test to compute the validity and reliability of the study questionnaire content. In order to complete the statistical analysis, the questionnaire was separated into two major parts, which are moderating variables: -

4.2.1 Moderating variables

Demographic information: -

- 1- Gender.
- 2- Age.
- 3- Education.
- 4- Experience.
- 5- Functional Degree.
- 6- Kind of Company.
- 7- Company age.

4.3 Validity and reliability of the questionnaire:

It is known that the validity of the questionnaire means the suitability of the phrases to what they were designed for in each axis of the questionnaire. The validity of the questionnaire was measured by presenting the questionnaire to specialists who reported the existence of an apparent validity of the questionnaire, and then the correlation coefficients (Pearson's correlation) between each questionnaire were tested. phrase and the entire axis. As for calculating the questionnaire's stability, the Cronbach's alpha coefficient was used to stabilize the questionnaire and it was

calculated through the SPSS program, and the discrimination coefficient was calculated for each phrase and the results showed an acceptable rate for the Cronbach's alpha coefficient, thus applying the questionnaire form to the research sample consisting of 150 forms.

4.4 Data analysis

After collecting data in a research study, the analysis of those data has completed. Data analysis implied pre-testing, coding and tabulation, and using statistical methods of analysis such as Graphs, Correlation Pearson, Alpha Cronbach test.

4.4.1 Reliability and Validity:

The researcher used the Alpha Cronbach reliability coefficient to measure the reliability of the content of the study variables, which was demonstrated as follows in the table: -

Table (2) Alpha Cronbach's Reliability Test

Axis	Abbreviation	Number of Items	Reliability
A1- Quality	QU	5	0.720
A2- Cost	Co	5	0.725
A3- Time	Ti	5	0.791
2- Project Management	EC	10	0.891
General Total	Total	25	0.818

It was found that: -

1. Alpha Cronbach coefficient for the total Axis of the study "The impact of the triangle (quality, cost, time) on project management in the steel sector in Riyadh", has reached stability coefficient for the total sample size (0.818) which indicates the very good degree of persistence of the study sample.
2. Alpha Cronbach coefficient for each Axis of the study which triangle (quality, cost, time) on project management, (0.720), (0.725), (0.791), (0.891) respectively showing a high degree of persistence.

4.4.2 Descriptive statistics of the Demographic variables of the study:

This was done by extracting the descriptive statistics for the study demographic variables (Gender, Age, Education, Experience, functional Degree, Kind of Company, Company age). The descriptive statistics is dealing with frequencies tables and percent, descriptive statistics ranking which included the following table: -

Table (3) Statistics for Demographic variables

		Gender	Age	Education	Experience	Functional Degree	Kind of Company	Company age
N	Valid	150	150	150	150	150	150	150
	Missing	0	0	0	0	0	0	0
Mean		1.51	2.67	2.40	2.24	3.66	1.51	3.13
Median		2.00	3.00	2.00	2.00	4.00	2.00	3.00
Mode		2	3	2	3	4	2	3
Std. Deviation		.501	1.020	.531	.739	1.469	.501	.929

It is clear from the table above that the indicators of the mean, median, mode, and standard deviation for the demographic variables are good, as they indicate that the data are fit around their arithmetic mean.

Frequency Table

Within the framework of this section, tables and figures for the demographic variables of the questionnaire are presented, and comments on each table are as follows: -

Table (4) Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	103	68.7	68.7	68.7
	Female	47	31.3	31.3	100.0
	Total	150	100.0	100.0	

It is clear from the table above that 69% of the sample size are men, and 31% of the sample size are women. This indicates that the workforce is mostly men, especially in the steel sector.

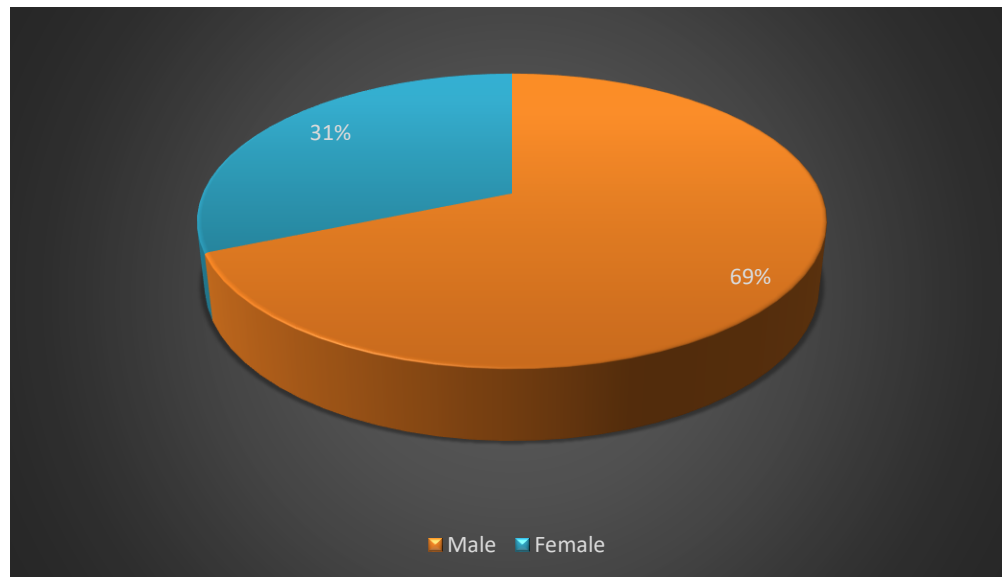
**Figure (1) Gender**

Table (5) Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 30	24	16.0	16.0	16.0
	30 to 39	33	22.0	22.0	38.0
	40 to 49	66	44.0	44.0	82.0
	50 to 59	22	14.7	14.7	96.7
	Above 60	5	3.3	3.3	100.0
	Total	150	100.0	100.0	

The previous table indicates that 44% of the sample size is from the age group from 40 to 49 years, 22% is from the age group from 30 to 39 years, 16% is from the age group less than 30 years, and 15% is from the age group 50 to 59 years. 3% of the age group is over 60 years.

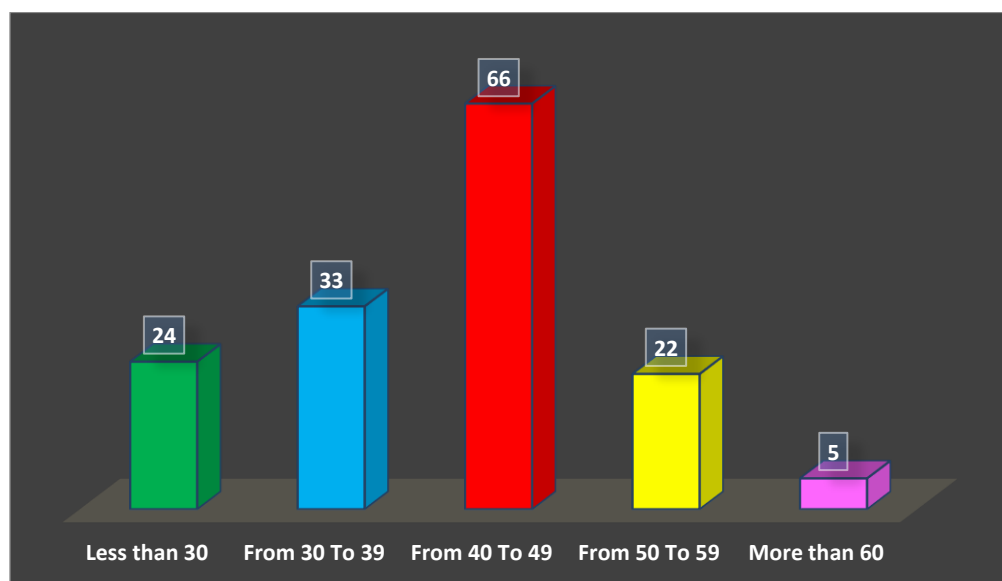
**Figure (2) Age**

Table (6) Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Secondary	3	2.0	2.0	2.0
	Bachelor	84	56.0	56.0	58.0
	Master/ Ph.D.	63	42.0	42.0	100.0
	Total	150	100.0	100.0	

The table indicates that 56% of the sample holds a bachelor's degree, 42% holds a master's or doctoral degree, and 2% of the sample holds only a high school diploma.

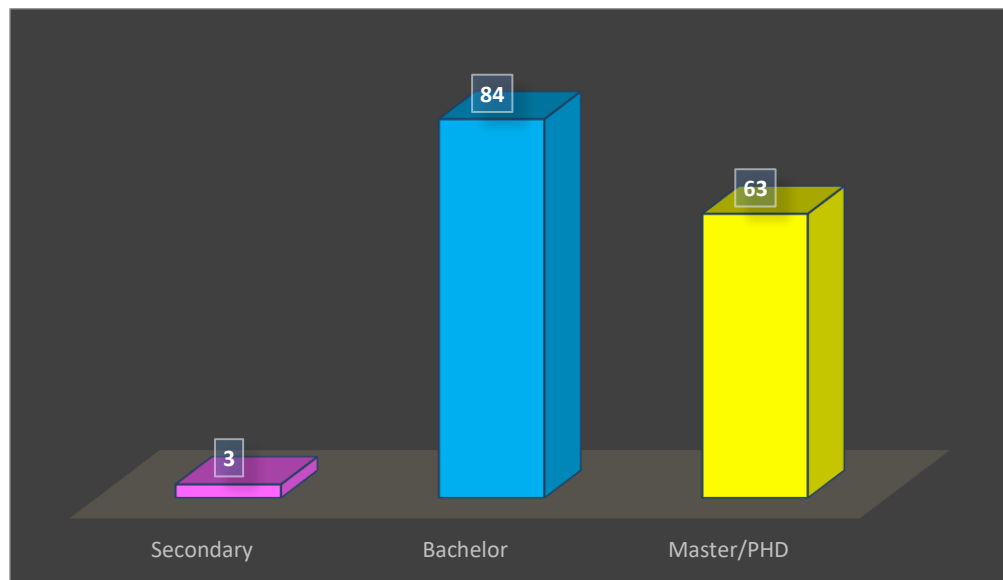
**Figure (3) Education**

Table (7) Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Till 10 Years	27	18.0	18.0	18.0
	From 10 to 20	60	40.0	40.0	58.0
	More than 20 Years	63	42.0	42.0	100.0
	Total	150	100.0	100.0	

It is clear from the table above that 42% of the sample size has experience of more than 20 years, 40% has experience between ten and twenty years, and 18% of the sample size has experience of up to ten years, and this indicates the average experience of the number of sample members is considered high, and this would give strength to the sample's opinions, which would benefit the research topic.

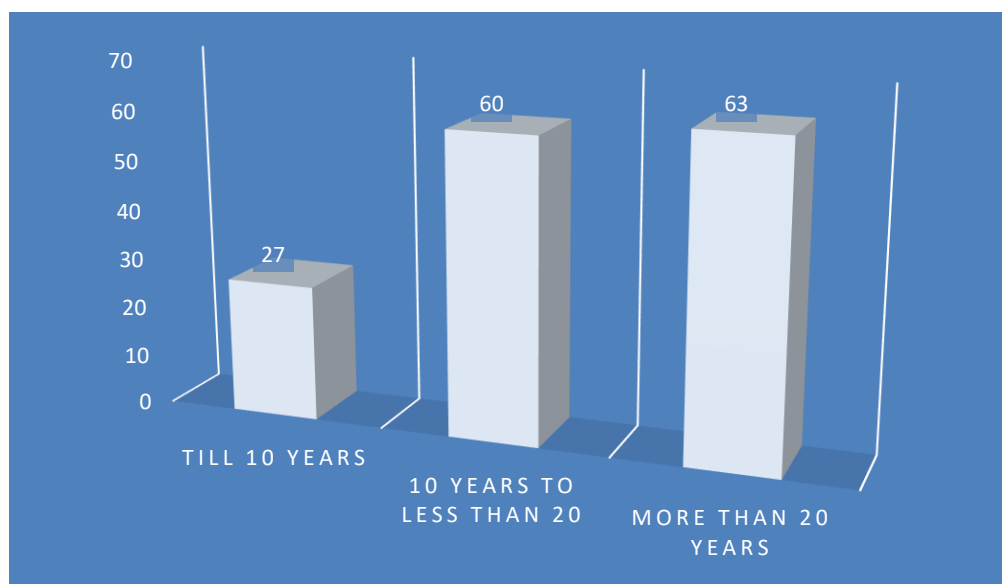
**Figure (4) Experience**

Table (8) Functional Degree

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Director general	8	5.3	5.3	5.3
	Department Manager	33	22.0	22.0	27.3
	Head of the Department	13	8.7	8.7	36.0
	Engineer	69	46.0	46.0	82.0
	Technical	12	8.0	8.0	90.0
	Employee	5	3.3	3.3	93.3
	Other	10	6.7	6.7	100.0
	Total	150	100.0	100.0	

The previous table indicates that 46% of the sample size are engineers, 22% are department managers, 9% are department heads, 7% for others, 5% are general managers, and 3% are employees.

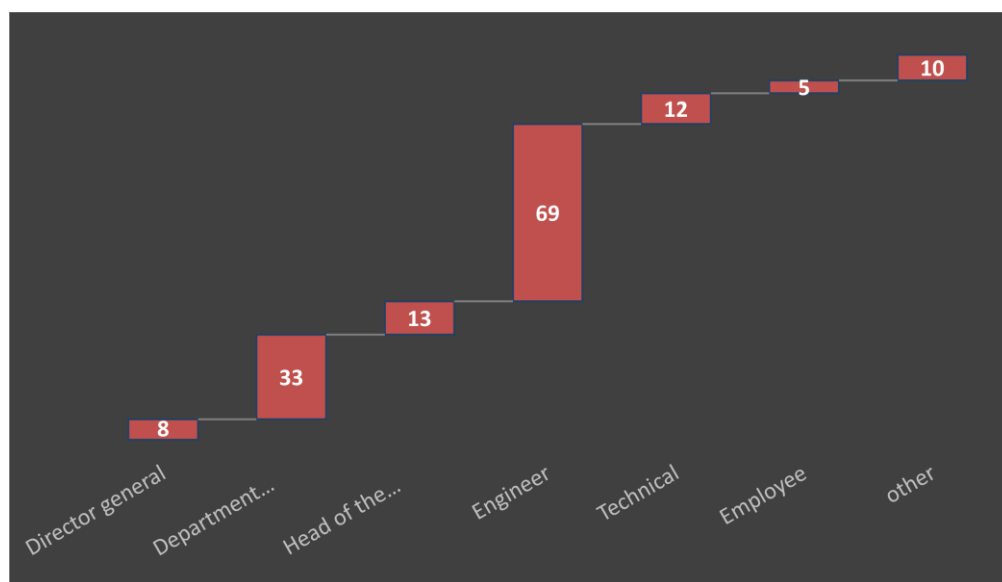
**Figure (5) Functional Degree**

Table (9) Kind of Company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Government sector	73	48.7	48.7	48.7
	Private sector	77	51.3	51.3	100.0
	Total	150	100.0	100.0	

It is clear from the previous table that 51% of the sample size is from the private sector, while 49% is from the government sector. It is noted that the percentage is close, as work is distributed between the government sector and the private sector almost equally, after most of the work was in the government sector in the past. This indicates to that the private sector has played an increasing role over time in economic activities, especially the steel sector in Riyadh.

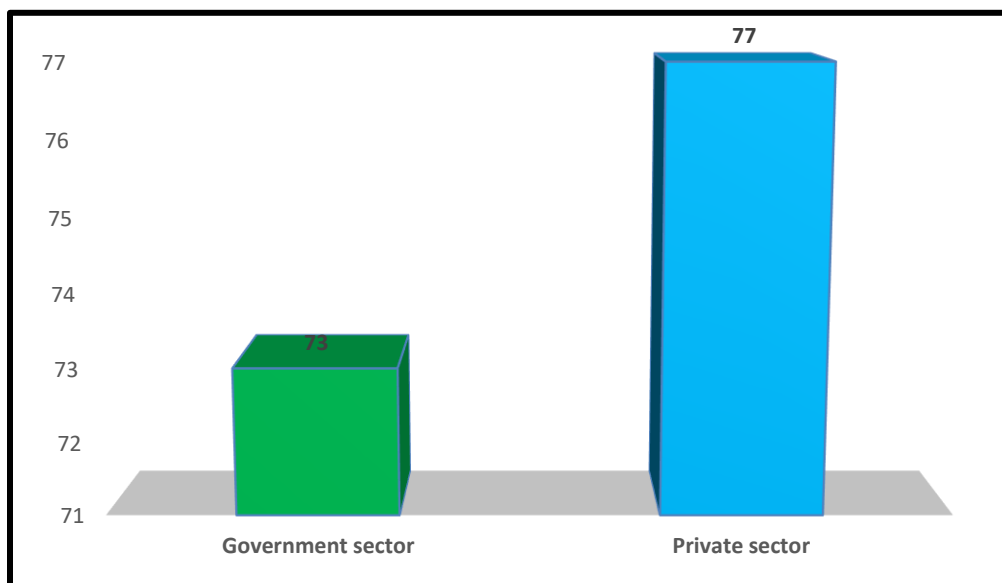
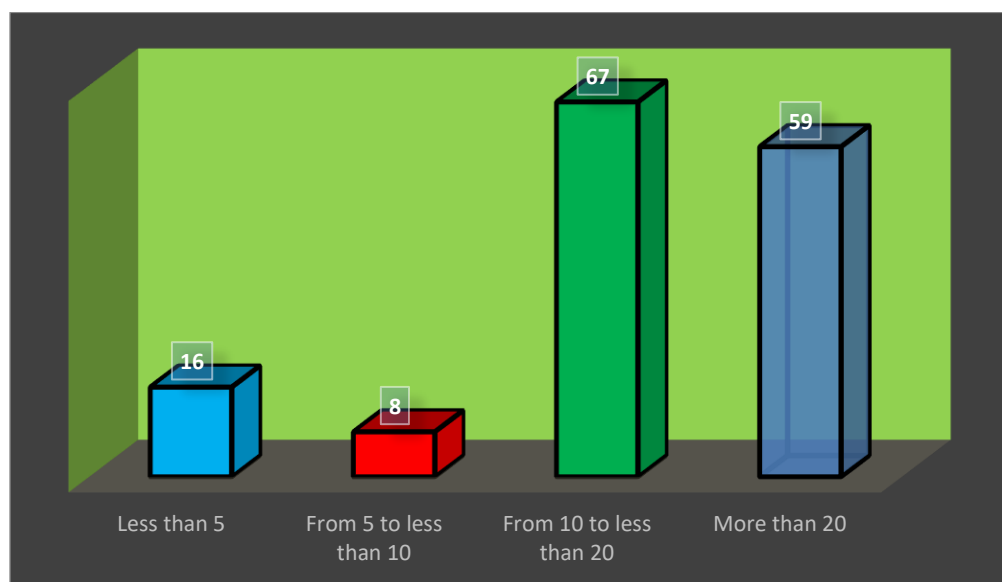
**Figure (6) Kind of Company**

Table (10) Company age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 5	16	10.7	10.7	10.7
	From 5 to less than 10	8	5.3	5.3	16.0
	From 10 to less than 20	67	44.7	44.7	60.7
	More than 20	59	39.3	39.3	100.0
	Total	150	100.0	100.0	

The table above indicates that 45% of the sample size work in a company that is between ten and thirty years old, and that 39% work in a company that is more than 20 years old, and that 11% work in a company that is up to five years old, and that 5% work in a company that is between five and ten years old, this indicates that most of the sample members work in companies whose economic life reaches more than 15 years or more as an average.

**Figure (7) Company age**

1.4.3 Descriptive statistics of the dependent and independent: In this section, the researcher will review the phrases of each axis, with the use of number of statistical indicators to indicate the importance of each of phrase, and the statistical indicators used are the arithmetic mean, the standard deviation, and the coefficient of variation, and ranking according to the coefficient of variation as follows: -

The First Axis: The Triangle Quality, Cost and Time

The following table shows Factors of the Quality, Cost and Time in terms of frequencies and percentages for each statement as follows: -

Table (11) The Frequencies and Percentages of the first Axis

N	Item	1	2	3	4	5	Tot	1	2	3	4	5	Tot
		F	F	F	F	F	F	%	%	%	%	%	%
1	TQU1	17	27	46	41	19	150	11.33	18.00	30.67	27.33	12.67	100
2	TQU2	4	25	26	64	31	150	2.67	16.67	17.33	42.67	20.67	100
3	TQU3	6	10	33	58	43	150	4.00	6.67	22.00	38.67	28.66	100
4	TQU4	2	4	18	75	51	150	1.33	2.67	12.00	50.00	34.00	100
5	TQU5	3	7	27	90	23	150	2.00	4.67	18.00	60.00	15.33	100
6	TQO1	5	11	42	69	23	150	3.33	7.34	28.00	46.00	15.33	100
7	TQO2	6	10	37	59	38	150	4.00	6.67	24.67	39.33	25.33	100
8	TQO3	1	15	54	63	17	150	0.67	10.00	36.00	42.00	11.33	100
9	TQO4	6	6	48	69	21	150	4.00	4.00	32.00	46.00	14.00	100
10	TQO5	2	7	35	71	35	150	1.33	4.68	23.33	47.33	23.33	100
11	TTI1	11	26	38	48	27	150	7.33	17.34	25.33	32.00	18.00	100
12	TTI2	23	24	54	37	12	150	15.33	16.00	36.00	24.67	8.00	100
13	TTI3	4	7	51	69	19	150	2.67	4.67	34.00	46.00	12.66	100
14	TTI4	12	14	33	64	27	150	8.00	9.33	22.00	42.67	18.00	100
15	TTI5	8	12	52	58	20	150	5.33	8.00	34.67	38.67	13.33	100

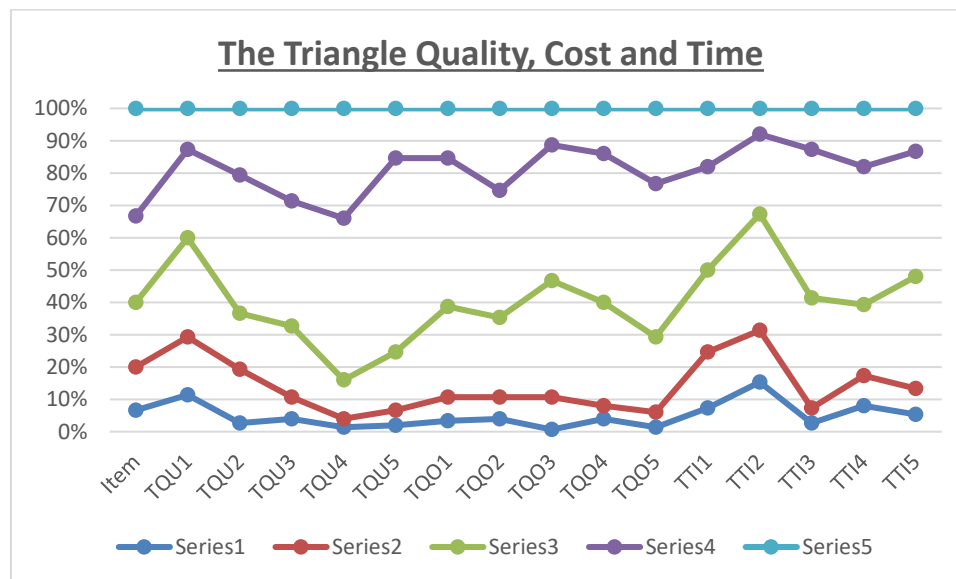


Figure (8) The Triangle Quality, Cost and Time

It is clear from the previous table regarding the quality axis that approximately 66% of the respondents' answers agree with the statements related to quality and its impact on project management in the steel sector in Riyadh. Likewise, regarding the cost axis, approximately 62% of the respondents' answers agree with the statements regarding cost and its impact on Project management in the steel sector in Riyadh. As for the time axis, approximately 52% of the respondents' answers agreed with the statements regarding time and its impact on project management in the steel sector in Riyadh.

The Second Axis: The Project Management

The following table shows Factors of the Project Management in terms of frequencies and percentages for each statement as follows: -

Table (12) The Frequencies and Percentages of the Second Axis

N	Item	1	2	3	4	5	Tot	1	2	3	4	5	Tot
		F	F	F	F	F	F	%	%	%	%	%	%
1	PM1	7	12	35	56	40	150	4.67	8.00	23.33	37.33	26.67	100
2	PM2	4	12	47	63	24	150	2.67	8.00	31.33	42.00	16.00	100
3	PM3	3	12	46	63	26	150	2.00	8.00	30.67	42.00	17.33	100
4	PM4	2	11	37	69	31	150	1.33	7.33	24.67	46.00	20.67	100
5	PM5	1	14	47	59	29	150	0.67	9.33	31.33	39.33	19.34	100
6	PM6	5	12	58	53	22	150	3.33	8.00	38.67	35.33	14.67	100
7	PM7	3	13	55	57	22	150	2.00	8.66	36.67	38.00	14.67	100
8	PM8	5	3	39	65	38	150	3.33	2.00	26.00	43.33	25.34	100
9	PM9	2	5	39	84	20	150	1.33	3.34	26.00	56.00	13.33	100
10	PM10	0	3	51	91	5	150	0.00	2.00	34.00	60.67	3.33	100

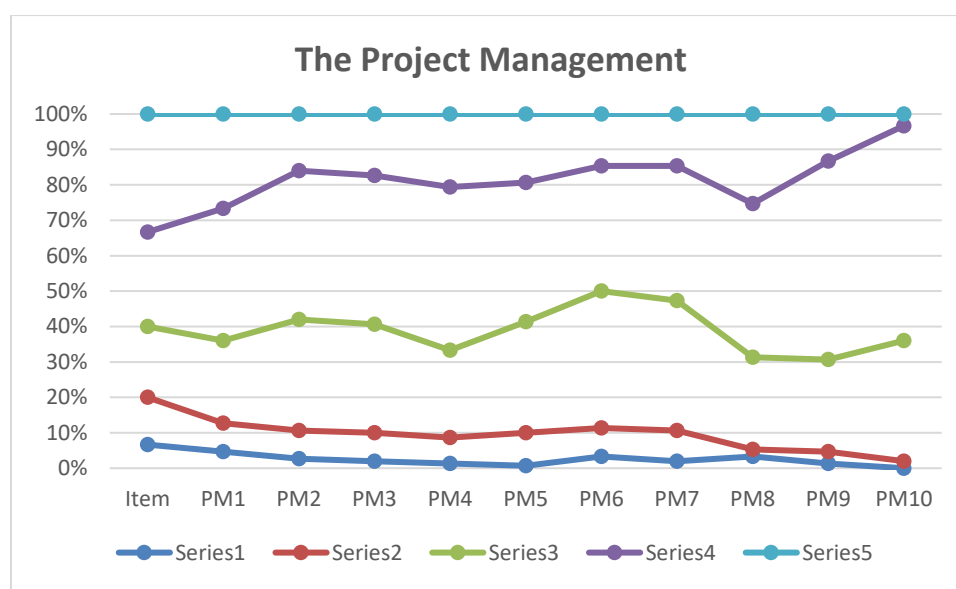


Figure (9) The Project Management

It is clear from the previous table regarding the project management axis that approximately 61% of the respondents' answers agree with the statements related to project management and its factors in the steel sector in Riyadh.

Reliability

The degree to which a set of items connect to one another as a consistent group is known as internal consistency or reliability, and the Cronbach's alpha coefficient is a measure of the internal consistency of statistical tests like questionnaires and comparable scales.

Scale: Quality

Table (13) Case Processing Summary for Quality

		N	%
Cases	Valid	150	100.0
	Excluded ^a	0	.0
	Total	150	100.0

a. Listwise deletion based on all variables in the procedure.

Table (14) Reliability Statistics for Quality

Cronbach's Alpha	N of Items
.720	5

For the quality axis, the Cronbach's alpha coefficient was 0.720, and this indicates high validity and reliability, as credibility is defined as the ability of the tools used in the research to measure what is intended to be measured.

Scale: Cost**Table (15) Case Processing Summary for Cost**

		N	%
Cases	Valid	150	100.0
	Excluded ^a	0	.0
	Total	150	100.0

a. Listwise deletion based on all variables in the procedure.

Table (16) Reliability Statistics for Cost

Cronbach's Alpha	N of Items
.725	5

The coefficient for the cost axis was 0.725, and this indicates an important statistical significance of high-level validity and reliability.

Scale: Time**Table (17) Case Processing Summary for Time**

		N	%
Cases	Valid	150	100.0
	Excluded ^a	0	.0
	Total	150	100.0

a. Listwise deletion based on all variables in the procedure.

Table (18) Reliability Statistics for Time

Cronbach's Alpha	N of Items
.791	5

With a Cronbach's alpha coefficient of 0.791, the time axis was found to have strong validity and reliability.

Scale: PM

Table (19) Case Processing Summary for Project Management

		N	%
Cases	Valid	150	100.0
	Excluded ^a	0	.0
	Total	150	100.0

a. Listwise deletion based on all variables in the procedure.

Table (20) Reliability Statistics for Project Management

Cronbach's Alpha	N of Items
.891	10

The PM coefficient reached 0.891, which means a high level of validity and reliability.

In general, it is clear that the Cronbach's alpha coefficient for all parts of the questionnaire is high and exceeds 60%, and this means the extent of Validity and high reliability in the research sample, which would indicate the possibility of relying on the questionnaire data in generalizing the results.

Correlations

Table (21) Correlations for Quality

		TQU1	TQU2	TQU3	TQU4	TQU5
TQU1	Pearson Correlation	1	-.043	.007	.012	-.060
	Sig. (2-tailed)		.601	.929	.886	.463
	N	150	150	150	150	150
TQU2	Pearson Correlation	-.043	1	.573**	.459**	.219**
	Sig. (2-tailed)	.601		.000	.000	.007
	N	150	150	150	150	150
TQU3	Pearson Correlation	.007	.573**	1	.525**	.482**
	Sig. (2-tailed)	.929	.000		.000	.000
	N	150	150	150	150	150
TQU4	Pearson Correlation	.012	.459**	.525**	1	.433**
	Sig. (2-tailed)	.886	.000	.000		.000
	N	150	150	150	150	150
TQU5	Pearson Correlation	-.060	.219**	.482**	.433**	1
	Sig. (2-tailed)	.463	.007	.000	.000	
	N	150	150	150	150	150

** . Correlation is significant at the 0.01 level (2-tailed).

The correlation coefficient indicates the strength of the linear relationship between variables. It ranges from zero to one, in a positive, negative, or equal relationship. A value of zero indicates that there is no relationship between variables. The closer the value is to zero, the lower the correlation. The closer the value is to One the correlation increased.

The previous table indicates the extent of correlation between the axis statements, at different levels and different types as well.

Table (22) Correlations for Cost

		TQO1	TQO2	TQO3	TQO4	TQO5
TQO1	Pearson Correlation	1	.365**	.543**	.377**	.200*
	Sig. (2-tailed)		.000	.000	.000	.014
	N	150	150	150	150	150
TQO2	Pearson Correlation	.365**	1	.441**	.120	.372**
	Sig. (2-tailed)	.000		.000	.145	.000
	N	150	150	150	150	150
TQO3	Pearson Correlation	.543**	.441**	1	.400**	.351**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	150	150	150	150	150
TQO4	Pearson Correlation	.377**	.120	.400**	1	.339**
	Sig. (2-tailed)	.000	.145	.000		.000
	N	150	150	150	150	150
TQO5	Pearson Correlation	.200*	.372**	.351**	.339**	1
	Sig. (2-tailed)	.014	.000	.000	.000	
	N	150	150	150	150	150

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

The previous table indicates the extent of correlation between the axis statements, at different levels and different types as well.

Table (23) Correlations for Time

		TTI1	TTI2	TTI3	TTI4	TTI5
TTI1	Pearson Correlation	1	.321**	.157	.167*	-.018
	Sig. (2-tailed)		.000	.055	.041	.825
	N	150	150	150	150	150
TTI2	Pearson Correlation	.321**	1	.064	-.001	.157
	Sig. (2-tailed)	.000		.439	.990	.055
	N	150	150	150	150	150
TTI3	Pearson Correlation	.157	.064	1	.527**	.520**
	Sig. (2-tailed)	.055	.439		.000	.000
	N	150	150	150	150	150
TTI4	Pearson Correlation	.167*	-.001	.527**	1	.507**
	Sig. (2-tailed)	.041	.990	.000		.000
	N	150	150	150	150	150
TTI5	Pearson Correlation	-.018	.157	.520**	.507**	1
	Sig. (2-tailed)	.825	.055	.000	.000	
	N	150	150	150	150	150

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

The previous table indicates the extent of correlation between the axis statements, at different levels and different types as well.

Table (24) Correlations for Project Management

		PM1	PM2	PM3	PM4	PM5	PM6	PM7	PM8	PM9	PM10
PM1	Pearson Correlation	1	.416**	.539**	.355**	.344**	.324**	.296**	.404**	.462**	.589**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	150	150	150	150	150	150	150	150	150	150
PM2	Pearson Correlation	.416**	1	.563**	.438**	.294**	.161*	.368**	.376**	.575**	.487**
	Sig. (2-tailed)	.000		.000	.000	.000	.049	.000	.000	.000	.000
	N	150	150	150	150	150	150	150	150	150	150
PM3	Pearson Correlation	.539**	.563**	1	.591**	.503**	.474**	.292**	.287**	.624**	.620**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000	.000	.000
	N	150	150	150	150	150	150	150	150	150	150
PM4	Pearson Correlation	.355**	.438**	.591**	1	.695**	.435**	.425**	.427**	.720**	.681**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000	.000	.000
	N	150	150	150	150	150	150	150	150	150	150
PM5	Pearson Correlation	.344**	.294**	.503**	.695**	1	.365**	.326**	.241**	.565**	.608**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.003	.000	.000
	N	150	150	150	150	150	150	150	150	150	150
PM6	Pearson Correlation	.324**	.161*	.474**	.435**	.365**	1	.545**	.436**	.497**	.595**
	Sig. (2-tailed)	.000	.049	.000	.000	.000		.000	.000	.000	.000
	N	150	150	150	150	150	150	150	150	150	150
PM7	Pearson Correlation	.296**	.368**	.292**	.425**	.326**	.545**	1	.555**	.570**	.574**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000	.000	.000

	N	150	150	150	150	150	150	150	150	150	150
PM8	Pearson Correlation	.404**	.376**	.287**	.427**	.241**	.436**	.555**	1	.528**	.512**
	Sig. (2-tailed)	.000	.000	.000	.000	.003	.000	.000		.000	.000
	N	150	150	150	150	150	150	150	150	150	150
PM9	Pearson Correlation	.462**	.575**	.624**	.720**	.565**	.497**	.570**	.528**	1	.733**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000		.000
	N	150	150	150	150	150	150	150	150	150	150
PM10	Pearson Correlation	.589**	.487**	.620**	.681**	.608**	.595**	.574**	.512**	.733**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	
	N	150	150	150	150	150	150	150	150	150	150

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

The previous table indicates the extent of correlation between the axis statements, at different levels and different types as well.

T-Test

One of the most significant and often applied statistical tests in investigations and studies that seek to elucidate the significance of statistical differences between sample averages is the T-Test.

Table (25) One-Sample Statistics for Quality

	N	Mean	Std. Deviation	Std. Error Mean
TQU1	150	3.12	1.187	.097
TQU2	150	3.62	1.072	.088
TQU3	150	3.81	1.052	.086
TQU4	150	4.13	.822	.067
TQU5	150	3.82	.820	.067

The quality axis formulas for the arithmetic mean, standard deviation, and average standard difference are shown in the preceding table. These metrics all show how the data is distributed around the arithmetic mean.

Table (26) One-Sample Test for Quality

Test Value = 0

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
TQU1	32.200	149	.000	3.120	2.93	3.31
TQU2	41.345	149	.000	3.620	3.45	3.79
TQU3	44.412	149	.000	3.813	3.64	3.98
TQU4	61.511	149	.000	4.127	3.99	4.26
TQU5	57.069	149	.000	3.820	3.69	3.95

The preceding table lists the quality axis statements that are used to calculate the value of T. It is evident from examining the calculated value of T that it is higher than the value of the tabulated T, and it is also evident that the level of significance is 0.000 in each statement, indicating that these statements have an impact on the dependent variable (project management).

Table (27) One-Sample Statistics for Cost

	N	Mean	Std. Deviation	Std. Error Mean
TQO1	150	3.63	.945	.077
TQO2	150	3.75	1.036	.085
TQO3	150	3.53	.849	.069
TQO4	150	3.62	.917	.075
TQO5	150	3.87	.872	.071

The same formulas as before are also displayed for the cost axis, which indicates the distribution of the data around its arithmetic mean.

Table (28) One-Sample Test for cost

Test Value = 0						
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
TQO1	46.997	149	.000	3.627	3.47	3.78
TQO2	44.378	149	.000	3.753	3.59	3.92
TQO3	50.987	149	.000	3.533	3.40	3.67
TQO4	48.340	149	.000	3.620	3.47	3.77
TQO5	54.300	149	.000	3.867	3.73	4.01

The expressions of the "cost" axis are displayed in the table above in order to measure the value of T. It is evident from an examination of the data that the computed value of T is higher than the tabular value of T. Also, the value of Sig. is more than 0.05, indicating that these variables have an effect on the dependent variable (project management).

Table (29) One-Sample Statistics for Time

	N	Mean	Std. Deviation	Std. Error Mean
TTI1	150	3.36	1.177	.096
TTI2	150	2.94	1.160	.095
TTI3	150	3.61	.865	.071
TTI4	150	3.53	1.133	.093
TTI5	150	3.47	1.001	.082

It is obvious from the statements of the time axis measure some ratios related to distributed data around mean.

Table (30) One-Sample Test for time

Test Value = 0						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
TTI1	34.951	149	.000	3.360	3.17	3.55
TTI2	31.044	149	.000	2.940	2.75	3.13
TTI3	51.141	149	.000	3.613	3.47	3.75
TTI4	38.188	149	.000	3.533	3.35	3.72
TTI5	42.410	149	.000	3.467	3.31	3.63

It is clear from the above that the calculated value of T is greater than the same tabulated value, as well as the value of Sig. which is less than 0.5 for all statements, and this means that there is an impact on project management.

Table (31) One-Sample Statistics for Project management

	N	Mean	Std. Deviation	Std. Error Mean
PM1	150	3.73	1.085	.089
PM2	150	3.61	.940	.077
PM3	150	3.65	.928	.076
PM4	150	3.77	.906	.074
PM5	150	3.67	.916	.075
PM6	150	3.50	.954	.078
PM7	150	3.55	.917	.075
PM8	150	3.85	.937	.076
PM9	150	3.77	.772	.063
PM10	150	3.65	.579	.047

The previous table shows the statements of the PM axis to measure Mean, SD, and ASD, which all shows the distribution of these data on its Mean.

Table (32) One-Sample Test for Project management

Test Value = 0						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
PM1	42.151	149	.000	3.733	3.56	3.91
PM2	46.968	149	.000	3.607	3.45	3.76
PM3	48.136	149	.000	3.647	3.50	3.80
PM4	51.011	149	.000	3.773	3.63	3.92
PM5	49.120	149	.000	3.673	3.53	3.82
PM6	44.951	149	.000	3.500	3.35	3.65
PM7	47.392	149	.000	3.547	3.40	3.69
PM8	50.375	149	.000	3.853	3.70	4.00
PM9	59.746	149	.000	3.767	3.64	3.89
PM10	77.261	149	.000	3.653	3.56	3.75

The PM axis is represented by the statements examining the calculated T, it is evident that it is greater than the tabulated T. Moreover, examining the level of significance, it is evident that it is 0.000 in every statement, indicating that these factors have an impact on PM.

One way

Table (33) ANOVA for Quality

		Sum of Squares	df	Mean Square	F	Sig.
TQU1	Between Groups	36.852	3	12.284	10.368	.000
	Within Groups	172.988	146	1.185		
	Total	209.840	149			
TQU2	Between Groups	71.219	3	23.740	34.618	.000
	Within Groups	100.121	146	.686		
	Total	171.340	149			
TQU3	Between Groups	98.674	3	32.891	72.651	.000
	Within Groups	66.099	146	.453		
	Total	164.773	149			
TQU4	Between Groups	45.928	3	15.309	40.888	.000
	Within Groups	54.665	146	.374		
	Total	100.593	149			
TQU5	Between Groups	38.368	3	12.789	30.228	.000
	Within Groups	61.772	146	.423		
	Total	100.140	149			

One-way analysis of variance (ANOVA) is a parametric test used to compare averages or reach a decision regarding the presence or absence of differences between performance averages in groups.

The previous table regarding the one-way analysis of variance (ANOVA) for the quality axis indicates that the calculated F value is greater than the tabulated F value, and the significance level

of this axis is 0.000, meaning that they are less than 0.05, which indicates the presence of a clear impact of this axis on project management. In the steel sector in Riyadh.

Table (34) ANOVA for Cost

		Sum of Squares	df	Mean Square	F	Sig.
TQO1	Between Groups	67.414	3	22.471	49.952	.000
	Within Groups	65.680	146	.450		
	Total	133.093	149			
TQO2	Between Groups	60.814	3	20.271	29.878	.000
	Within Groups	99.059	146	.678		
	Total	159.873	149			
TQO3	Between Groups	61.348	3	20.449	64.926	.000
	Within Groups	45.985	146	.315		
	Total	107.333	149			
TQO4	Between Groups	40.004	3	13.335	22.814	.000
	Within Groups	85.336	146	.584		
	Total	125.340	149			
TQO5	Between Groups	33.519	3	11.173	20.438	.000
	Within Groups	79.814	146	.547		
	Total	113.333	149			

The previous table regarding the one-way analysis of variance (ANOVA) for the cost axis indicates that the calculated F value is greater than the tabulated F value, and the significance level for all statements of this axis is 0.000, meaning that they are less than 0.05, which indicates the presence of a clear impact of this axis on project management. In the steel sector in Riyadh.

Table (35) ANOVA for time

		Sum of Squares	Df	Mean Square	F	Sig.
TTi1	Between Groups	51.858	4	12.964	12.151	.000
	Within Groups	154.702	145	1.067		
	Total	206.560	149			
TTi2	Between Groups	53.935	4	13.484	13.344	.000
	Within Groups	146.525	145	1.011		
	Total	200.460	149			
TTi3	Between Groups	47.997	4	11.999	27.366	.000
	Within Groups	63.577	145	.438		
	Total	111.573	149			
TTi4	Between Groups	67.001	4	16.750	19.535	.000
	Within Groups	124.332	145	.857		
	Total	191.333	149			
TTi5	Between Groups	69.771	4	17.443	31.789	.000
	Within Groups	79.562	145	.549		
	Total	149.333	149			

The previous table regarding the one-way analysis of variance (ANOVA) for the time axis indicates that the calculated F value is greater than the tabulated F value, and the significance level of this axis is 0.000, meaning that they are less than 0.05, which indicates the presence of a clear impact of this axis on project management. In the steel sector in Riyadh.

Table (36) ANOVA for Project management

		Sum of Squares	Df	Mean Square	F	Sig.
PM1	Between Groups	69.442	4	17.360	23.772	.000
	Within Groups	105.892	145	.730		
	Total	175.333	149			
PM2	Between Groups	47.566	4	11.891	20.472	.000
	Within Groups	84.227	145	.581		
	Total	131.793	149			
PM3	Between Groups	69.636	4	17.409	43.049	.000
	Within Groups	58.638	145	.404		
	Total	128.273	149			
PM4	Between Groups	68.409	4	17.102	46.021	.000
	Within Groups	53.885	145	.372		
	Total	122.293	149			
PM5	Between Groups	57.587	4	14.397	30.969	.000
	Within Groups	67.406	145	.465		
	Total	124.993	149			
PM6	Between Groups	53.953	4	13.488	23.983	.000
	Within Groups	81.547	145	.562		
	Total	135.500	149			
PM7	Between Groups	45.168	4	11.292	20.465	.000
	Within Groups	80.005	145	.552		

	Total	125.173	149			
PM8	Between Groups	43.929	4	10.982	18.337	.000
	Within Groups	86.844	145	.599		
	Total	130.773	149			
PM9	Between Groups	67.330	4	16.833	113.507	.000
	Within Groups	21.503	145	.148		
	Total	88.833	149			
PM10	Between Groups	35.555	4	8.889	89.394	.000
	Within Groups	14.418	145	.099		
	Total	49.973	149			

Regarding the one-way analysis for PM axis, indicates that the calculated F is greater than the tabulated F, and the sig. for this axis is 0.000, meaning that they are less than 0.05, which indicates a clear effect of the quality and cost and time factors on project management in the steel sector in Riyadh.

Regression

Table (37) Variables Entered/Removed a

Model	Variables Entered	Variables Removed	Method
1	TotTTI, TotTQU, TotTQO ^b	.	Enter

a. Dependent Variable: Total2

b. All requested variables entered.

Table (38) Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.864 ^a	.747	.175	.639

a. Predictors: (Constant), TotTTI, TotTQU, TotTQO

It is clear from the table above that the value of R is 0.864, and the value of R square is 0.747. This means that the independent variables, which are quality, cost, and time, can explain 75% of the changes that occur in the dependent variable, which is project management.

Table (39) ANOVA a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14.124	3	4.708	11.519	.000 ^b
	Residual	59.670	146	.409		
	Total	73.793	149			

a. Dependent Variable: Total2

b. Predictors: (Constant), TotTTI, TotTQU, TotTQO

Table (40) Coefficients a

		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
Model		B	Std. Error	Beta	t	Sig.	Tolerance
1	(Constant)	1.429	.401		3.559	.001	
	TotTQU	.124	.078	.124	1.582	.116	.904
	TotTQO	.284	.084	.266	3.384	.001	.896
	TotTTI	.230	.081	.220	2.830	.005	.919

From the previous table, the regression equation for the research model can be deduced as follows:

-

$$\text{PM} = 1.429 + 0.124 \text{ Quality} + 0.284 \text{ Cost} + 0.230 \text{ Time}$$

Table (41) Coefficients a

		Collinearity Statistics
Model		VIF
1	(Constant)	
	TotTQU	1.106
	TotTQO	1.116
	TotTTI	1.089

a. Dependent Variable: Total2

The above table makes it evident that the VIF value is less than 3, which suggests that there might be a little amount of linear interference.

Table (42) Collinearity Diagnostics a

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	TotTQU	TotTQO	TotTTI
1	1	3.936	1.000	.00	.00	.00	.00
	2	.029	11.738	.00	.30	.05	.81
	3	.023	12.983	.00	.52	.65	.06
	4	.013	17.681	.99	.18	.30	.13

a. Dependent Variable: Total2

4.5 Testing hypotheses

Research Hypothesis'

Hypothesis -1

H1: There is a statistically significant impact at level $\alpha \leq 0.05$ of triangle of quality, cost and time on project management in the steel sector in Riyadh.

The main hypothesis is divided into the following sub-hypotheses: -

H1.1: There is a statistically significant impact at level $\alpha \leq 0.05$ of quality on project management in the steel sector in Riyadh.

H1.2: There is a statistically significant impact at level $\alpha \leq 0.05$ of cost on project management in the steel sector in Riyadh.

H1.3: There is a statistically significant impact at level $\alpha \leq 0.05$ of time on project management in the steel sector in Riyadh.

4.6 Statistical method used:

One Sample T test

If Sig. is ≤ 0.05 , it means that we will accept the sub-hypothesis1 which states “There is a statistically significant impact at level $\alpha \leq 0.05$ of quality on project management in the steel sector in Riyadh.”.

But if Sig. is > 0.05 , it means that we will reject the sub-hypothesis1 which states “There is a statistically significant impact of quality on project management in the steel sector in Riyadh.”.

And so on for the second and third sub-hypotheses.

Statistical method used:

Table (43) T-test
Project Management (dependent)
and Triangle Quality, Cost and time (independent)

The Axis	T-test	Sig.	F Value	p-value	Result
1. Quality	47.31	0.000	37.75	0.000	Accept
2. Cost	49.00	0.000	37.60	0.000	Accept
3. Time	39.55	0.000	20.84	0.000	Accept
4. Project Management	51.71	0.000	43.00	0.000	Accept
Total	46.89	0.000	34.80	0.000	Accept

* Correlation is significant level 0.05

For sub-hypothesis No. 1, the significance level value, as well as the p value ≤ 0.05 , it means accepting the hypothesis that states, “There is a statistically significant impact at level $\alpha \leq 0.05$ of quality on project management in the steel sector in Riyadh.”

For sub-hypothesis No. 2, the significance level value, as well as the p value ≤ 0.05 , it means accepting the hypothesis that states, “There is a statistically significant impact at level $\alpha \leq 0.05$ of cost on project management in the steel sector in Riyadh.”

For sub-hypothesis No. 3, the significance level value, as well as the p value ≤ 0.05 , it means accepting the hypothesis that states, “There is a statistically significant impact at level $\alpha \leq 0.05$ of time on project management in the steel sector in Riyadh.”

Accordingly, the following decision can be reached:

There is a statistically significant impact at level $\alpha \leq 0.05$ of triangle of quality, cost and time on project management in the steel sector in Riyadh.

CHAPTER 5

DISCUSSION AND CONCLUSION

5. This chapter contains comprehensive coverage of the discussion and interpretation resulting from what was verified in the study's hypotheses, and the validity of the questionnaire results. In addition, this chapter presents discussions related to the limitations of the study and the results and recommendations of the study.

5.1. Discussion

The purpose of the discussion is to explain and describe the importance of the results that were reached after testing the study hypotheses, and also by answering the questions and research problem that were presented in the first chapter, and also to investigate the points that were presented regarding the impact of quality, cost and time on project management in The steel sector in Riyadh, and the recommendations reached after reviewing the results will be presented.

5.2. Conclusion

The conclusion aims to help readers understand the importance of the research, its objectives, and the research method used to carry out the research through the various stages to reach the results.

The following is mentioned in relation to the questionnaire results that were gathered and subsequently examined using the specialist statistical application SPSS:

Several significant statistical indicators were employed, including the ANOVA analysis and T-test, since these are the most significant indicators that are used to test the study hypotheses and gather data from the questionnaire that is, of course, after assuring the questionnaire's validity and reliability.

The statistical analysis was examined for the T-test, which takes into account multiple questionnaire axes. The significance level for the quality axis was 0.000, or less than 0.05. Therefore, it can be concluded that project management in the steel industry in Riyadh is affected by the quality factor.

The analysis of the T-test was reviewed for the cost axis, the sig. level was 0.000, which is less than 0.05. So, there is an obvious impact of the cost factor on PM in the steel sector in Riyadh.

The analysis of the T-test was also reviewed for the time axis, the sig. was 0.000, which is less than 0.05. So, there is an impact of the time factor on PM in the steel sector in Riyadh.

Using ANOVA analysis which shows that the Sig. level is less than 0.05. Therefore, there is an impact of the quality factor on PM in the steel sector in the city of Riyadh.

The statistical analysis of the ANOVA analysis was also reviewed, which indicates the different axes of the questionnaire. For the cost axis, the significance level was 0.000, which is less than 0.05. So, there is an impact of the cost factor on PM in the steel sector in Riyadh.

The ANOVA analysis was also reviewed, which shows the different axes of the questionnaire. As for the time axis, the level of significance was 0.000, which is less than 0.05. Therefore, there is an impact of the time factor on PM in the steel sector in Riyadh.

As for the project management axis, looking at the t-test, as well as the ANOVA analysis, I found the significance level to be 0.000, which is less than 0.05. Therefore, this means that there is an impact of the three previously mentioned factors, which are quality, cost, and time, on project management in the steel sector in Riyadh.

5.2.1 Results:

Regarding the quality factor: -

It was found that the company examines resource requirements, whether people, equipment or materials, for each element of the project separately. This indicates the extent of benefiting from all the capabilities and capabilities available to companies.

It is noted that when evaluating resource requirements for the current project, the company uses information from similar projects completed previously. This indicates the extent of benefiting from the accumulated experience of companies in implementing new projects.

The company monitors whether the actual resources used in the project elements are consistent with those proposed in the project book. This is a good thing.

The Company takes immediate action if there is a discrepancy between the actual resources used and the proposed resource requirements. This is a good thing, of course.

The company strives to promote a culture of excellence and take into account customer comments, given that customer opinions of these companies determine their level of success.

Regarding the cost factor: -

The study came to the crucial conclusion that project cost management is essential to project management's overall performance.

The investigation also found that the business can supply the different equipment and supplies required for the project at the right prices and timings.

According to the study's findings, project cost management is effective if the project is finished within the allocated budget, which is why it's crucial for clients to keep an eye on this.

If there is a difference (in quantity, cost, or both) between the actual resources used and the resource requirements in the budget book, the organization responds right away.

The company always compares the cost of the project with the return and ensures that the cost does not exceed the estimated level in order to maintain the profitability of the project.

Regarding the time factor: -

The study concluded that daily performance is included in the list of tasks that are accomplished daily according to decisions arranged according to priorities.

Project activities are defined according to a schedule that identifies and documents the planned work.

The study concluded that the project is being implemented according to a realistic timetable. Because time is an essential factor.

Scheduling daily activities plays a major role in accelerating the completion of the planned project.

The daily project schedule is determined as part of the integrated monitoring process by senior management.

Regarding the Project Management factor: -

Regarding project management only, the study found that communication takes place between the company's various departments when starting to implement, develop, and improve the project. This is one of the advantages that customers care about, of course.

Projects are well prepared to be completed meticulously to meet clients' needs and expectations.

The company takes the opinions and suggestions of its employees as well as customers to reach the best performance.

The company provides a clearly defined strategic vision known to all employees.

The company is always keen to enhance and develop the capabilities of employees.

Continuous improvement is the responsibility of everyone in the company in order to achieve the highest levels of quality in project completion.

The company uses complaints and grievances from customers to improve the quality of project completion.

The company makes continuous comparisons of the level of customer satisfaction with other companies competing with it in the activity.

Employees are committed to continuous improvement and development processes in completing projects.

Material and moral rewards and incentives are provided to employees to encourage them to complete projects with better quality.

5.2.2 Recommendations

1. Senior management should pay more attention to improving quality, cost and time factors because of their ability to have a positive and effective impact on project management.
2. It is necessary to establish clear, written and announced policies related to the quality system, so that they are adhered to in the implementation of projects.
3. The necessity of continuous training for all workers in project management, including engineers, workers, supervisors, planners, and administrators, in order to achieve efficiency and effectiveness in performance levels, and also to keep pace with new technology in the field of work.
4. Ensure to benefit from customers' opinions about the level of quality provided in the projects delivered to them, and also know the extent of their satisfaction with the cost and commitment to delivering projects within the previously agreed upon times.

5. The need to increase the participation of employees at all levels of the decision-making process to improve quality.
6. Work to develop a good system of rewards and incentives for all those working in project management.
7. Corporate participation of key stakeholders in setting plans and goals for the company.

5.5. Limitations and Scope for Future Research

Every research project is understood to have boundaries that it must follow and be constrained by; naturally, the validity of the research falls inside these bounds. The purpose of this study is thought to be to determine the amount to which quality, cost, and time considerations affect project management in the steel industry in the city of Riyadh, where the research was applied, and to explore the possibilities of practical application. However, in the case of the city of Riyadh, this is not seen as a limitation on the research; rather, it was required in order for it to be put into practice. The researcher also examined the literature in the second chapter. It was broken down into two sections: one on project management in the steel industry and the other on quality, cost, and time aspects. The third chapter also reviewed the methodology used in this research, as well as scientific concepts and other important matters regarding this topic. The statistical analysis of the research data was also reviewed in the fourth chapter.

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Appendices



RESEARCH ON

**The impact of the triangle (quality, cost, time) on projects
management in the steel sector in Riyadh**

**أثر مثلث (الجودة، التكلفة، الوقت) على إدارة المشاريع في قطاع الحديد
بالرياض**

QUESTIONNAIRE BOOKLET

Sultan Khalaf Alotaibi

Abdullah Mansour Alhejaili

Hamdan Abdullah Alharbi

2023

Dear Respondent,

We are Master's degree candidates at the MIDOCAEN UNIVESITY Currently, we conducting a study titled " **The impact of the triangle (quality, cost, time) on projects management in the steel sector in Riyadh** ". The purpose of this study is to examine the quality, cost and time on project management in the steel sector in Riyadh at Kingdom of Saudi Arabia. We would like to request your cooperation to answer this questionnaire. Any information obtained will be kept strictly confidential and only be used for academic purposes. Your cooperation is highly appreciated.

Thank you in advance for agreeing to participate in this study. If you have any questions, please do not hesitate to contact my honorable team leader, **Sultan Alotaibi**.

Supervised by:

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wamid@esu.ac.ae

PhD. Alfaisal Abdelhameed

Sultan Alotaibi

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Master Candidate

Faculty of Projects Management

MIDOCEAN UNIVERSITY

United Arab Emirates

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عزيزي المستجيب،

نحن مرشحون للحصول على درجة الماجستير في (إدارة المشاريع) بجامعة ميدأوشن نقوم حالياً بإجراء دراسة بعنوان " أثر مثلث (الجودة، التكلفة، الوقت) على إدارة المشروعات في قطاع الحديد بالرياض ". الغرض من هذه الدراسة هو فحص أثر الجودة، التكلفة والوقت على ادارة المشاريع في قطاع الحديد بالرياض في المملكة العربية السعودية.

نود أن نطلب منك التعاون للإجابة على هذا الإستبيان وسيتم الإحتفاظ بأي معلومات يتم الحصول عليها بسرية تامة ولن يتم استخدامها إلا للأغراض الأكاديمية فقط نقدر تعاونك كثيراً.

شكراً لك مقدماً على موافقتك على المشاركة في هذه الدراسة إذا كان لديك أي أسئلة، فالرجاء عدم التردد في الاتصال بقائد الفريق سلطان العتيبي.

المشرفين:

البروفيسور د. وليد سليمان
walid@esu.ac.ae

البروفيسور د. الفيصل عبد الحميد

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مرشح لدرجة الماجستير

كلية ادارة المشاريع

جامعة ميدأوشن

الإمارات العربية المتحدة

skalotaibi88@gmail.com

Part1: Demographic information on respondents

الجزء الأول: معلومات ديموغرافية عن المستجيبين

1- Gender النوع

ذكر Male	أنثى Female

2- Age العمر

Less than 30	30 to 39	40 to 49	50 to 59	Above 60
أقل من 30	39-30	49-40	59-50	60 فأكثر

3- Education التعليم

Secondary	Bachelor	Master/ Ph.D.
ثانوى	بكالوريوس	ماجستير/دكتوراه

4- Experience الخبرة

Till 10 Years	From 10 to 20	More than 20 Years
حتى 10	من 10 لأقل من 20	أكثر من 20

5- Functional Degree الدرجة الوظيفية

Director general	Department Manager	Head of the Department	Engineer	Technical	Employee	other
المدير العام	مدير الإدارة	رئيس القسم	مهندس	فنى	موظف	اخرى

6- Kind of Company نوع الشركة

Government sector	Private sector
قطاع حكومى	قطاع خاص

7- Company age عمر الشركة

Less than 5	From 5 to less than 10	From 10 to less than 20	More than 20
أقل من 5	من 5 الى أقل من 10	من 10 الى أقل من 20	أكثر من 20

Part2: Triangle (quality, cost, time)

الجزء 2: مثلث الجودة – التكلفة – الوقت

Please indicate your degree of agreement or disagreement with the following statements, so please sign (✓) for the choice that reflects your opinion by choosing one of the five alternatives.

يرجى الإشارة إلى درجة موافقتك على العبارات التالية. تشير جميع الأسئلة الواردة في هذا الاستبيان إلى اختيارك الذي حددته

Item		1	2	3	4	5
		لا أوافق مطلقاً	لا أوافق	محايد	أوافق	أوافق جداً
		Strongly Disagree	Disagree	Natural	Agree	Strongly Agree
	Quality الجودة					
TQU1	The company examines the resource requirement (people, equipment and materials) for each of the project elements separately تقوم الشركة بفحص متطلبات الموارد (الأشخاص والمعدات والمواد) لكل عنصر من عناصر المشروع على حدة					
TQU2	In evaluating the resource requirement for the current project the company uses information from previously completed similar projects عند تقييم متطلبات الموارد للمشروع الحالي، تستخدم الشركة معلومات من مشاريع مماثلة تم إنجازها مسبقاً					
TQU3	The company follows up whether the actual resources used in project elements are in accordance with that proposed on the project book تقوم الشركة بمتابعة ما إذا كانت الموارد الفعلية المستخدمة في عناصر المشروع متوافقة مع تلك المقترحة في دفتر المشروع					
TQU4	The company takes immediate action in case of discrepancy b/n the actual resources used and the proposed resource requirement تتخذ الشركة إجراءات فورية في حالة وجود تناقض بين الموارد الفعلية المستخدمة ومتطلبات الموارد المقترحة					
TQU5	The company works to enhance the culture of quality and interests for the opinion of customers تعمل الشركة على تعزيز ثقافة الجودة وتهتم برأى العملاء					
	Cost التكلفة					
TQO1	Project cost management plays a vital role for the overall success of the project management تلعب إدارة تكاليف المشروع دورًا حيويًا في النجاح الشامل لإدارة المشروع					

TQ02	The company is able to provide the various materials and machines required by the project at the appropriate cost تتمكن الشركة من توفير المواد والالات المختلفة التي يتطلبها المشروع بالتكلفة المناسبة					
TQ03	A project cost management is said to be successful if the project is finalized within the approved budget يُقال إن إدارة تكلفة المشروع تكون ناجحة إذا تم الانتهاء من المشروع ضمن الميزانية المعتمدة					
TQ04	The company takes immediate action in case of variance (in quantity, cost or both) between actual resources used and the resource requirement in the budget book تتخذ الشركة إجراءات فورية في حالة الاختلاف (في الكمية أو التكلفة أو كليهما) بين الموارد الفعلية المستخدمة ومتطلبات الموارد في دفتر الميزانية					
TQ05	The company always compares the cost of the project with the return and makes sure that the cost does not exceed the estimated level in order to maintain the profitability of the project تقارن الشركة دائما تكلفة المشروع بالعائد وتحرص ألا تتجاوز التكلفة المستوى المقدر له للحفاظ على ربحية المشروع					
الوقت Time						
TTI1	Daily performance is included in the list of tasks that are completed daily according to decisions arranged according to priorities الاداء اليومي يكون ضمن قائمة الاعمال التي يتم انجازها يوميا وفقا لقرارات مرتبة حسب الأولويات					
TTI2	Project activities are determined according to a timetable that defines and documents the planned work يتم تحديد أنشطة المشروع وفق جدول زمني لتعريف وتوثيق العمل المخطط					
TTI3	The project is being implemented according to a realistic timetable يتم تنفيذ المشروع وفق جدول زمني يتسم بالواقعية					
TTI4	Scheduling daily activities plays a major role in speeding up the completion of the planned project ان جدولة الأنشطة اليومية تؤدي دورا كبيرا في سرعة انجاز المشروع المخطط له					
TTI5	The project's daily schedule is set as part of the integrated control process by senior management يتم ضبط الجدول الزمني اليومي للمشروع كجزء من عملية الرقابة المتكاملة من قبل الادارة العليا					

Part3: Projects Management

الجزء 3: إدارة المشاريع

Please indicate your degree of agreement or disagreement with the following statements, so please sign (✓) for the choice that reflects your opinion by choosing one of the five alternatives.

يرجى الإشارة إلى درجة موافقتك على العبارات التالية. تشير جميع الأسئلة الواردة في هذا الاستبيان إلى اختيارك الذي حددته

Item		1	2	3	4	5
		لا أوافق مطلقاً	لا أوافق	محايد	أوافق	أوافق جداً
		Strongly Disagree	Disagree	Natural	Agree	Strongly Agree
PM1	Communication takes place between the various departments of the company when starting to implement, develop and improve the project يتم التواصل بين مختلف أقسام الشركة عند البدء في تنفيذ المشروع وتطويره وتحسينه					
PM2	Good preparation is done to complete projects accurately to meet the needs and expectations of customers يتم الإعداد الجيد لإنجاز المشاريع بشكل دقيق لتلبية احتياجات وتوقعات العملاء					
PM3	The company takes the opinions and suggestions of its employees as well as customers to reach the best performance تأخذ الشركة بآراء ومقترحات العاملين فيها وكذا العملاء للوصول إلى أفضل أداء					
PM4	The company provides a clearly defined strategic vision known to all employees توفر الشركة رؤية إستراتيجية واضحة المعالم ومعروفة لجميع الموظفين					
PM5	The company is always keen to enhance and develop the capabilities of employees تحرص الشركة دائماً على تعزيز وتطوير إمكانيات الموظفين					
PM6	Continuous improvement is the responsibility of everyone in the company in					

	order to achieve the highest quality in project completion يعتبر التحسين المستمر مسؤولية جميع من في الشركة من أجل تحقيق أعلى جودة في إنجاز المشروعات					
PM7	The company uses complaints and grievances from customers to improve the quality of project completion تستعين الشركة بالشكاوى والتظلمات من العملاء لتحسين جودة إنجاز المشاريع					
PM8	The company conducts constant comparisons of the level of customer satisfaction with other companies competing with it in the activity تجرى الشركة مقارنات دائمة لمستوى رضا الزبائن مع مؤسسات أخرى منافسة لها في النشاط					
PM9	Workers are committed to continuous improvement and development processes in completing projects يلتزم العمال بعمليات التحسين والتطوير المستمر في إنجاز المشاريع					
PM10	Material and moral rewards and incentives are provided to employees to encourage them to complete projects with better quality يتم تقديم مكافآت وحوافز مادية ومعنوية للعاملين لتشجيعهم على إنجاز المشروعات بجودة أفضل					

Gratitude

We appreciate you for sparing your time to fill out the survey. Your involvement means a lot to us and we highly value it. The information you shared is significant to our analysis and will enable us to make this topic.

Once again, we are very grateful for your contribution.

Sincerely

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Saudi Arabia

إمتنان

نحن نقدر لك توفير وقتك للإجابة على الإستبيان، مشاركتك تعني لنا الكثير ونحن نقدرها بشدة. المعلومات التي شاركتها مهمة لتحليلنا وستمكنا من جعل هذا الموضوع أكثر دقة ووضوحاً.

مرة أخرى، نحن ممتنون جداً لمساهماتك.

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المملكة العربية السعودية

شكراً لكم..