

**LEADERSHIP COMPETENCIES AND THEIR EFFECT ON PROJECT
PERFORMANCE IN CONSTRUCTION INDUSTRY IN KSA**

BY

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**A Thesis Presented to the
DEANSHIP OF GRADUATE STUDIES**

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

DHAHRAN, SAUDI ARABIA

**In Partial Fulfillment of the
Requirements for the Degree of**

MASTER OF SCIENCE

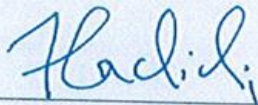
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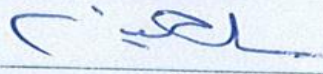
May 2023

DEANSHIP OF GRADUATE STUDIES

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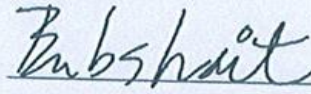


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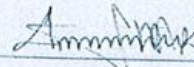
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I am dedicating this research thesis to my role model father Dr.Nedal Al-Ratrout and to my CEM department at KFUPM

|

ACKNOWLEDGMENTS

I am pledging my thesis to several individuals who have played crucial roles in my academic journey. Firstly, I would like to express my heartfelt gratitude to Professor Ali Shash, my advisor, for his unwavering help, guidance, and support throughout the research process. I also want to thank my loved ones, my close friend Zaid, and my family for their encouragement and understanding during my studies.

In addition, I am grateful to my committee advisors, Professor Abdulaziz Bubshait and Dr. Ibrahim Yahaya Wuni, for their valuable insights and advice that have significantly contributed to the success of my thesis. Lastly, I would like to thank my employer, Precision Polymer Engineering, and specifically my direct line manager, Mr. Omer Raoof, for his continued support during my studies. He has been incredibly understanding and supportive towards my MSc journey, and I appreciate his constant encouragement and assistance.

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LIST OF ABBREVIATIONS

APMBOK	:	Association for Project Managers Body of Knowledge
PMBOK	:	Project Managers Body of Knowledge
PRINCE2	:	Projects IN Controlled Environment Version 2
PMI	:	Project Management Institute
APM	:	Association for Project Management
LC	:	Leadership competencies
AQ	:	Administrative Quotient
CS	:	Client/End-User Satisfaction
EQ	:	Emotional Quotient
GA	:	Overall Goal Attainment
IPQ	:	Interpersonal Quotient
IQ	:	Intelligence Quotient
LQ	:	Leading Organizations
LC	:	Leading Organizations
MP1Q	:	Managing People
MP2Q	:	Managing Programs
MPQ	:	Managing Projects Quotient

MQ	:	Managerial Quotient
MSQ	:	Managing Self Quotient
PP	:	Project Performance
TS	:	Team Satisfaction

|

ABSTRACT

Full Name : [Faisal Nedat Al-Ratrout]
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PROJECT PERFORMANCE IN CONSTRUCTION INDUSTRY IN
KSA]
Major Field : [Construction Engineering and Management]
Date of Degree : [May 2023]

The goal of every business is to increase the success rate of projects. Therefore, to evaluate the success of a project, it must be examined in-depth from every angle. In recent years, the range of leadership competencies recognized in the field of project management has grown substantially. However, there is still room for exploration into what skills are necessary for project managers to effectively lead their teams and complete their assignments. Lacking leadership competencies has been cited as the cause of many failed projects. The construction industry is one of the industries that require leadership competencies models to deal with and boost project results. The purpose of this study is to construct and validate a leadership competency framework for project managers and to identify the connection between leadership competencies and project performance. The study investigated the relationship between the leadership competencies of project managers and project performance in the construction industry in Saudi Arabia. The data were gathered through a questionnaire targeting grade 1 and grade 2 contractors in the eastern province of Saudi Arabia. The results of this study provided insights into the essential leadership competencies that project managers should possess to enhance project performance. The study's major findings reveal that various leadership competency dimensions significantly impact project manager performance. Managing Self Quotient

(MSQ) and Emotional Quotient (EQ) demonstrate the highest effect sizes, indicating a strong positive influence. Managerial Quotient (MQ), Managing Programs (MP2Q), and Managing People (MP1Q) also exhibit a notable positive impact. Moderate effects on project manager performance are observed for Managing Projects Quotient (MPQ), Leading Organizations (LQ), Interpersonal Quotient (IPQ), Administrative Quotient (AQ), and Intelligence Quotient (IQ). All predictor variables show a statistically significant positive effect on project performance. Managing People Quotient (MP1Q), Managing Projects Quotient (MPQ), and Managing Self Quotient (MSQ) display the strongest effects, while Intelligence Quotient (IQ) and Managing Programs Quotient (MP2Q) exhibit weaker effects. Customer satisfaction and task satisfaction are strongly linked to project performance. Prioritizing the most effective competencies, particularly in leadership and managing people, can enhance project outcomes in the construction industry by optimizing resources and efforts. The research hoped that this study would raise awareness about the significance of leadership skills in project success and assist company owners in making key choices about the skills they may need to learn to successfully guide their firms in the proper path.

|

ملخص الرسالة

الاسم الكامل: فيصل نضال الرطوط

عنوان الرسالة: : الكفاءات القيادية وتأثيرها على أداء المشاريع في صناعة البناء والتشييد في المملكة العربية السعودية

التخصص: هندسة إدارة البناء والتشييد

تاريخ الدرجة العلمية: مايو 2023

هدف كل عمل هو زيادة معدل نجاح المشاريع، ولذلك يجب تقييم نجاح المشروع بشكل دقيق من جميع الجوانب. في السنوات الأخيرة، نمت مجموعة الكفاءات القيادية المعترف بها في مجال إدارة المشاريع بشكل كبير. ومع ذلك، لا يزال هناك مجالاً للاستكشاف لمعرفة المهارات اللازمة لقادة المشاريع لفرقهم بفعالية وإكمال مهامهم بنجاح. وقد ذكر عدم وجود الكفاءات القيادية كسبب لفشل للعديد من المشاريع. صناعة البناء والتشييد هي واحدة من الصناعات التي تتطلب نماذج للكفاءات القيادية للتعامل مع نتائج المشاريع وتعزيزها. الغرض من هذه الدراسة هو إنشاء وتحقيق نموذج للكفاءات القيادية لمديري المشاريع وتحديد الصلة بين الكفاءات القيادية وأداء المشروع. قامت الدراسة بتحقيق العلاقة بين الكفاءات القيادية لمديري المشاريع وأداء المشروع في صناعة البناء والتشييد في المملكة العربية السعودية. تم جمع البيانات من خلال استبيان يستهدف المقاولين من الدرجة 1 والدرجة 2 في المنطقة الشرقية من المملكة العربية السعودية. توفر نتائج هذه الدراسة نظرة على الكفاءات القيادية الأساسية التي يجب أن يتمتع بها مديرو المشاريع لتعزيز أداء المشروع. ويأمل البحث أن يساهم في رفع الوعي بأهمية المهارات القيادية في نجاح المشروع ومساعدة أصحاب الشركات في اتخاذ القرارات الرئيسية حول المهارات التي قد يحتاجون إلى تعلمها لتوجيه شركاتهم بالطريق الصحيح

CHAPTER 1 | INTRODUCTION

The concept of leadership can be traced back to early human civilization. Most researchers agree that leadership was a key indicator of civilization since it signified an understanding that authority needed to be centralized (Hasan et al., 2018). According to realism theorists, centralization of authority is necessary to promote order (Kempster & Carroll, 2016). Borrowing from this realism viewpoint, leadership is vital in a typical company for promoting order and achieving goals and fulfil its objectives.

While leadership is an ancient idea, it has undergone multiple changes to adapt the variable environment in which centralization of authority is crucial (Jamsari et al., 2012). Leadership is considered important in modern culture, particularly in the corporate context. Researchers have taken an increased interest in the topic of leadership in the twenty-first century (Hunter & Cushenbery, 2011). According to Dulewicz & Higgs (2005a), leadership is "the art and science of getting others to do what you want them to do." This definition assumes that individuals are to be led, by someone who is a leader, to achieve the organization's objectives and goals. Gruban (2003) pointed out, Leadership Competency (LC) is the capacity to apply one's accumulated knowledge to guide a group of people for a shared goal. This results in the actualization of desired outcomes or the successful execution of a plan in an organizational setup. Knowledge, expertise, skills, motivation, values, beliefs, fundamental personality and behavioral attributes, all contribute to a project manager's overall leadership competency.

1.1 Statement of the Problem

Increasing the success rate of projects is a goal shared by nearly every business. The project's success is not fully measurable, until it has been handed off to the client and put into use (Razmdoost & Mills, 2016). To evaluate the success of a project, it must be examined in depth from every angle (Todorović et al., 2015). With the focus on theory and model development, project performance can be evaluated in a better way (Williams, 2005). It is crucial to learn more about the essential skills required to create successful comprehensive LC model that reflects relationship between the LC and project performance (Loufrani-Fedida & Missonier, 2015). Previous studies have been focusing on identifying and learning about leadership competencies to construct leadership models (Hollenbeck et al., 2006)”. These models explain the intermix and fusion of competencies that contribute to successful projects.

In recent years, the range of leadership competencies required in project management field has grown substantially (PMI, 2013). However, there is still room for exploration into what skills are essential for project managers to effectively lead their teams and complete their assignments (Wright & Taylor, 1985). There is a gap in research on how leadership competencies correspond to project performance (Anantatmula, 2015; Battilana et al., 2010; Müller et al., 2012; Nixon et al., 2012; Yang et al., 2013). Lacking leadership competencies has been cited as the main reason behind the failure of most projects (Berg & Karlsen, 2016). One of the major reasons is that project managers fail to effectively manage resources, please stakeholders, finish on time, and make necessary adjustments to boost project performance. These are some of the prominent lacking leadership traits (Ogunlana et al., 2002; Sunindijo, 2015).

Companies that run numerous projects at once, require leadership competencies models to accomplish and boost project results (Todorović et al., 2015). Theoretical assumptions of leadership competencies models are discussed by Hollenbeck et al. (2006). However, they did not create or test a model which can be utilized to enhance organizational project performance. Based on a thorough literature study, Anantatmula, (2015) selected specific leadership skills and analyzed the data collected from the survey of 69 American project management experts by using the questionnaire and the Interpretive Structural Modeling (ISM) technique. As Hollenbeck et al. (2006) pointed out, existing leadership models may be improved and expanded if the link between leadership traits is better understood. According to Attakora-Amaniampong (2016), project manager competencies and project outcomes should be studied more. “Anantatmula (2015); Attakora-Amaniampong (2016); Berssaneti & Carvalho (2015); and Loufrani-Fedida & Missonier (2015)” make claims about the need for research on competent project management and leadership, whereas few studies have examined its relationship empirically (Yang et al., 2013). The following research question will be investigated:

- What is the Leadership Competency framework for a construction project manager?
- How the leadership competencies of a project manager affect the project performance?

1.2 Research Objectives

A manager's leadership skills are essential to boost success of the project. However, the leadership skills of a project manager in dealing with people have received little attention. The purpose of this study is

- To construct and validate a leadership competency framework for construction project managers.
- To identify the relation between leadership competencies of project managers and their project performance.

1.3 Significance of Study

This study aims to raise awareness about the significance of leadership skills in project success. This, in turn, may motivate company owners to ensure that they have the correct leadership in place and urge those leaders to strive toward consistently improving their leadership traits. Furthermore, the research aims to add to the knowledge base, notably in the field of leadership competencies in the construction industry. Furthermore, it may assist contractors in making key choices about the skills they need to learn to successfully gauge their projects in the right direction. Moreover, the current research might be seen as a starting point in demonstrating different leadership competencies of relevance to academic studies relating to leadership competencies, reporting decision-making, and their effect on project performance.

1.4 Research Scope and Limitations

Specifically, this study aims to evaluate the effects of project managers' leadership competencies on performance of construction projects in Saudi Arabia. Hence, this study is limited to construction sector, and generalizing the results to other industry sectors may be questionable. Moreover, the data is gathered from grade 1 and grade 2 contractors as the mega projects are usually held by that type of contractors. In addition, due to time and cost constraints, the study is done only in the eastern province of Saudi Arabia.

1.5 Thesis Organization

This thesis is sectioned into five chapters. Chapter 1 (Introduction) is an elaborate introduction to the topic, which is further divided into three parts; 1) problem statement, 2) research objectives, and 3) significance of the study. Chapter 2 (Lecture review) presents an overview of project management and its areas of knowledge. It also provides a summary of leadership competencies, and its definition as well as discusses some of the project manager's leadership competencies. Finally, it overviews some of the studies conducted in the field of leadership competencies. Chapter 3 (Methodology) explains in detail all mediators and variables for developing the model and measuring the relationship between leadership competencies and project performance. Chapter 4 (Result Discussion) interprets the results obtained from the questionnaire survey. Chapter 5 (Conclusion and recommendations) summarizes whole study, draws conclusions based on the outcomes of the research, and outlines the recommendations for future development and improvement.

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CHAPTER 2 | LITERATURE REVIEW

Many researchers have addressed Leadership Competency in an effort to reveal the traits that help in selecting and assigning individuals to leadership positions for success. This chapter presents and builds upon the previous published work in the field of Leadership Competency.

2.1 Overview of Project Management

Only 25% of US construction projects assessed between 2012 and 2015 met their original schedules by 10% (Zippia, 2022). This motivated the organizations and project managers to experiment with project management techniques that can boost the likelihood of project's success, such as project completion on time, complying with client's specifications, and making sure no cost overrun takes place. According to Chin et al. (2010), these approaches are project management methodologies and application development methodologies. He further categorizes these approaches into four categories namely: best practices, standards and guidelines, organization-specific customized methodology, Individual methodology, Project specific methodology and Sector-specific methodology (Chin et al., 2010). Karaman & Kurt (2015) point out in their study, that the PMBOK, PRINCE2, and APMBOK are included in the best practices, standards, and guidelines category.

The knowledge required for effective project management is exemplified by best practices, which have been shaped by international organizations such as PMI (Meredith et al., 2020). Since the guidelines are generic, they can be applied to any business or field

and any form of project. Cleland & Ireland (2006) state that for the past ten to fifteen years, PMBOK material has been the focus of intensive study and dissemination efforts for professional project management associations. PMI's, Fifth Edition, lays out the 10 essential skills every project manager should have. These organizations routinely engage in research and development activities with the goal of better enforcing the PMBOK rules throughout project execution.

2.1.1 Areas of expertise in project management

According to Jowah (2013), traditional approaches to project management relied heavily on frameworks like the "Critical Path Method (CPM)", the "Programmed Evaluation and Review Technique (PERT) and the "Work Breakdown Structure (WBS). The growing importance of projects to the success of businesses necessitated the development of new methods for overseeing such endeavors, methods capable of meeting the numerous obstacles that have arisen in this field. PMI and APM, the leading organizations in the field of project management, have devised a curriculum for their respective standards. In 1969, PMI was created and in 1976 the PMBOK was established.

The Association for Project Management (APM) came up with its own body of knowledge because it felt the PMBOK provided by the Project Management Institute (PMI) didn't go far enough to meet the needs of project managers. While the PMI bases any project's success on the traditional "triple constraints" (time, cost, and scope) of a project; the Association for Project Management (APM) takes a different tack by placing more emphasis on behavioral aspects and also taking into account the project's context, as well as general, commercial, and technological factors (Jowah, 2013)

The PMI breaks down the large field of project management into ten manageable parts which are referred in PMBOK 5th edition, as 10 project management knowledge areas.

Figure 2.1 below, is a graphical representation of the 10 knowledge areas.

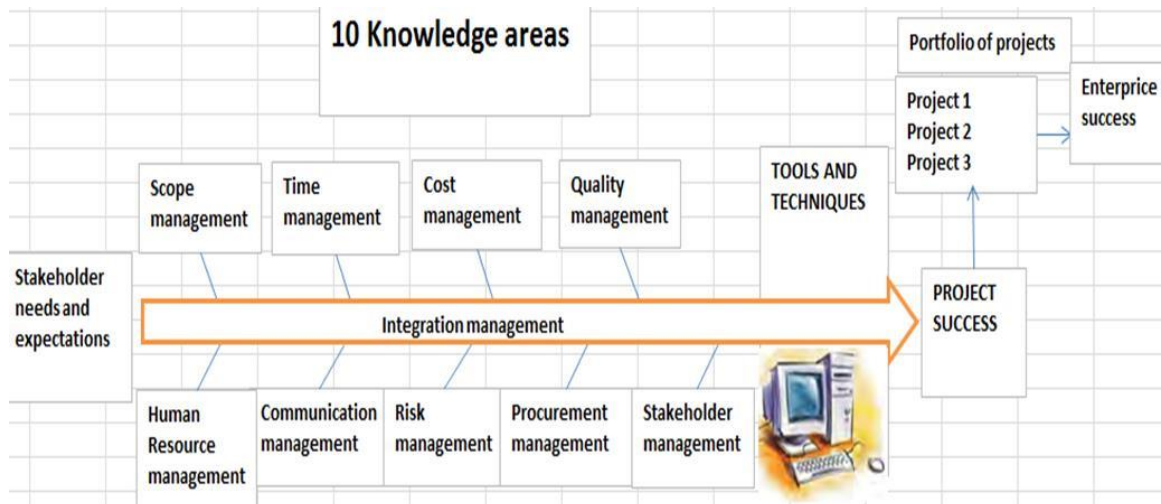


Figure 2. 1: Graphical representation of the 10 knowledge areas (Makunga, 2019)

- **“Project Integration Management”**

The establishment of the project charter and the project management plans occur within the domain of knowledge known as project integration management, which binds the project together. The stages of a project that are included under this area of knowledge are; beginning (Initiation), middle (Planning and Execution), end (Monitoring and Controlling), and completion (Closing).

- **Project Scope Management**

The practices under project management ensure that the project comprises all of the essential tasks to successfully execute the project as per customer specifications. This knowledge domain is responsible for planning of scope, its definition, verification, and scope change control. Scope definition document specifies the client’s expectations for the delivery of project in specific, quantifiable terms. Cho & Gibson (2001) concur that a

poorly defined scope will cause the project to fail; this indicates that the project practitioners recognize an ill-defined scope as the top cause of project's failure.

- **Project Time Management**

A project is described as a short-term endeavor that is carefully planned and conducted to attain a specific goal within a timeline. Project time management is concerned with project activity length estimations, activity description, and activity sequencing. Hence, Project Time Management refers to the process which is necessary to manage the time required to finish the project.

- **Project Cost Management**

To make it sure that a project is completed within its specified budget, it is necessary to implement a system of cost management that takes into account the management of resources, budgeting, financing, and managing costs. Costs associated with a project can be broken down into three groups, as described by Gray & Larson (2018); project overhead, direct costs, and general administrative costs. In this context, "direct costs" refers to the expenses made in advance for things like labor, tools, and other consumables that will be utilized directly in the execution of the project. Costs that may be indirectly attributed to the project are known as overhead costs, for example, the salary of a software engineer on a software development project. Daily operations result in general administrative expenditures. Expenses like these include office supplies, utilities, rent, and others.

- **Project Quality Management**

Project quality was described by Gitlow et al. (2002) as "the extent to which the delivered product or service meets the requirements of the customer and is fit for the purpose for which it was designed." Quality management of a project includes both quality control and quality assurance. To verify that all of the project's needs have been satisfied, quality management must be used.

- **Project Human Resource Management**

Human resource management for projects includes putting together teams, finding new members and training them so that they can work together effectively (Jowah, 2013). For completion of the project, each member of the project team has specific duties to perform. These individuals might be either temporary or permanent additions to the team, depending on the requirements of the project. Team members' dedication to the project improves when they are given a voice in its direction.

- **Project Communication Management**

Studies show that 90% of the time of a project manager is spent talking to people. According to Shenhar & Dvir (2007), effective and timely planning, collecting and distributing the information, storage and retrieval of data; managing, controlling and disposing project information, are all included in project communication management.

- **Project Risk Management**

Kutsch & Hall (2009) defines risk as "an unpredictable event or circumstance associated with a project that, if it occurs, will affect the project's objectives, either positively or adversely." In the world of project management, the risk is a major focus.

Process of identifying risk, planning a response to risk, analyzing, monitoring and regulating responses, are all part of project risk management. The primary goal of risk management is to lessen the likelihood of any unforeseen circumstances that may have negative effect on the project, while simultaneously increasing the likelihood that it will have a positive effect. It is argued that by properly managing risks, project managers can minimize its effect on the project's outcome (Kutsch & Hall, 2009)

- **Project Procurement Management**

For successful accomplishment, some projects require the help of external vendors and suppliers who can provide the necessary goods and/or services. The goal of procurement management is to establish and maintain positive and productive relationships with such external vendors and suppliers. According to Bovis (2007), an efficient procurement system necessitates well-articulated procedures to ensure that all dealings are conducted transparently, and an audit trail exists. An efficient and effective procurement policy will guarantee that the contracts are given to the most cost-effective vendors.

- **Project Stakeholder Management**

Stakeholder management in projects involves figuring out who stands to gain or lose something from the project's completion. Once all the relevant parties are located, an analysis is conducted to determine what each group expects out of the project. Strategies for effective engagement with all stakeholders are implemented when the stakeholders are identified and analyzed to understand their impact on the project.

2.1.2 Project Success Criteria

The exact criterion of project success has remained vague until recently. The standard success metrics of time, money, and quality provide little useful information for fulfilling project objectives successfully. The importance of identifying the primary success factors of a project increases for businesses in a highly competitive marketplace (Didenko & Konovets, 2009). Jugdev & Müller (2005) examined how our conception of what defines project success is evolving, arguing that project success is not a set fixed target. Back in the 1980s, much importance was given on using the proper tools and methods. In addition, Pinto & Trailer (1998) identified the ten most crucial elements for a successful project, regardless of the type of project. However, the list lacked information related to the project manager's competency or suitability for the project. Wateridge (1995) suggested that, when deciding on how to manage the projects, project managers first need to identify the critical success criteria for their projects. After that they should identify the success factors which will assist them in achieving those criteria, and finally decide on what tools and techniques will be employed with those factors.

In the past, projects were evaluated based on how long and how much money it took to finish (Razmdoost & Mills, 2016). Referring to the "iron triangle," a project is considered a success if and only if its timeline, budget, and final deliverables meet or surpass its stakeholders' expectations (Berssaneti & Carvalho, 2015). The iron triangle's focus on the project's near-term aspects is crucial to the client's immediate success. The ability of a project to sustain its competitive edge over time is highly valued by clients as well as project stakeholders (Berssaneti & Carvalho, 2015; Mir & Pinnington, 2014; Yang et al., 2013, 2015).

The stakeholder salience theory proposes that the priorities of several parties may have a sizable effect on the final product of a given project (Berssaneti & Carvalho, 2015). Traditionally, projects were graded on how effectively they stuck to their budget, completed their work by the deadline, and produced satisfactory results. Almahmoud et al. (2012) explains on how a project is managed has a direct impact on how much time and money are invested in it, but that these factors alone are insufficient for measuring success (Nixon et al., 2012). The project's success can be evaluated by its ability to: (1) fulfill its deadlines; (2) stay within its budget; and (3) provide outcomes that meet or exceed expectations (Meng, 2012). Overruns in both cost and time are a common result of sloppy project management (Ibbs et al., 2001). In addition, other factors including quality performance and stakeholder satisfaction, must be included to obtain a whole picture of the project's success (Almahmoud et al., 2012; Berssaneti & Carvalho, 2015; Yang et al., 2013, 2015). A project's success can be determined by how well it meets its goals in terms of time, money, quality, and stakeholder satisfaction (Berssaneti & Carvalho, 2015).

Success criteria are "the standards by which the success or failure of a project or enterprise will be measured," as defined by Cooke-Davies (2002). It is also, "the set of principles or standards by which judgment is formed and are believed to be the rule of the game," as Lim & Mohamed (1999) put it. Project's success, according to Baccarini (1999), can be measured from several angles. For example, success may be defined as meeting or exceeding targets for technical performance, timely completion of the project and within budget, or generating the anticipated financial return. Additionally, Shenhar et al. (1997) proposed four factors for measuring project's success: duration, specification, customer satisfaction, and business performance/ future prospects.

Alternatively, Baccarini (1999) suggested a Logical Framework Method for determining project success. He categorized project goals into four categories: end result, process, input, and output. Baccarini identifies two main factors that add to a project's success. First, Baccarini contended that good project management is characterized by an emphasis on cost, budget, and quality, as well as an evaluation of inputs and outcomes. Product completion is the focus of the project's second phase. Westerveld (2003), on the other hand, used the literature to create a model called the Project Excellence Framework for Quality Management (EFQM-model) that correlates project success criteria with project success variables.

Morris (1988) and Morris & Hough (1987) established a seven forces model that contains a “people force”, evaluating the people on the project and its management, leadership, teamwork, and industrial relations. He understood that including strong leadership in the project's overall approach was crucial to its ultimate success. Cooke-Davies (2002), on the other hand, said that project outcomes still often dissatisfy stakeholders despite decades of individual and collective experience in project management. Cooke-Davies' research emphasized on cost, time, and quality while analyzing project success and establishing relevant success criteria. However, it did not discuss the people aspect of project management neither emphasized over the project managers' competencies and leadership capacity when establishing the success components (Cooke-Davies, 2002).

Cooke Davies' (2002) distinction between project's success and project manager's success is one of the most influential contributions to the field in the current decade. According to Cooke-Davies, project success is measured by the achievement of planned

business results using the project's outcome (typically a new product or service), while project manager's success is measured by the achievement of time, cost, quality, or other goals set for the management of the project by manager itself. Despite the research's emphasis on risk management, program and portfolio management, and benefits management, the study's identified factors did not include the project manager's competency. Müller & Turner (2007) defines 'on time, within budget, and to specification' as the benchmark for measuring success, especially for information technology initiatives. Andersen et al. (2006) explains both, "the project management success" and "the project product success" in their study, the latter of which refers to the project's end result. To quote what Salleh (2009) said, "a project is considered a success if it meets its three primary goals of time, budget, and quality."

2.2 Overview of Leadership Competencies

Different competencies frameworks have emerged in the field of project management. For instance, the IPMA Competencies Baseline and the PMBOK Guide, which was designed and created by the "Project Management Institute" (PMI, 2013). In total, the IPMA identifies 46 different characteristics of competencies, classifying them as either (a) context, (b) behavior, or (c) technical expertise. The Project Management Institute (PMI, 2013) divides project management knowledge into ten discrete areas of expertise. When taken together, the knowledge categories of the "Project Management Body of Knowledge (PMBOK)" and the IPMA skills baseline form a comprehensive foundation for project management. These frameworks put no emphasis on strong leadership for achieving project success and organizational advancement (Hollenbeck et al., 2006). Hollenbeck et al.'s model (2006)" focuses on personality traits, and McCrae &

John's model (1992) focuses on general management ideas, and separate leadership styles. There is a strong correlation between a project manager's lack of leadership competencies and the eventual failure of the project, which is why leadership competency models are viewed as helpful for project managers in their pursuit of project success (Nixon et al., 2012). Managers of projects must also excel in every phase of the project's life cycle (Meredith et al., 2020).

The ability to gain the trust of the project's team and the stakeholders who are most invested in its success is a must for any project manager. With this link established, participants in the project are less likely to second-guess themselves when making decisions or disclosing information. Burke et al. (2007) discovered that when there was trust between managers and employees, the projects came out better. Trust is a two-way street in projects, with one party granting the other some degree of vulnerability. To be successful, a project needs both its management (the trustee) and its stakeholders (the trustor) to be reliable (Brewer & Strahorn, 2012)

Managers of such endeavors must not only inspire trust in their teams but also keep a close eye on the project and adjust as necessary. The project's priorities must be set and kept in mind at all times. Also, the right people at the right times should be given the proper responsibilities for the right objectives. Managers of projects should hold meetings with everyone who is interested in the project's outcome and its applicability to the business as a whole (Kloppenborg et al., 2003). Managers of such endeavors must therefore maintain an upbeat tone among project stakeholders so that the projects can be used to advance the organization's objectives (Kloppenborg et al., 2003).

2.2.1 Leadership Definition

The term "leadership" refers to "the process of guiding the efforts of others to achieve a shared objective (Hersey et al., 2014). More and more people are interested in learning project managers' leadership abilities as the number of project-based businesses is increasing (Ke & Wei, 2008). Definition of capacity by Loufrani-Fedida & Missonier, 2015 is, "the ability of an individual, group, or organization to marshal and integrate resources (i.e., knowledge, skills, and attitudes) to carry out a given task." It has been argued that a by analyzing the management style of its project manager, project's success or failure can be predicted (Geoghegan & Dulewicz, 2008; Keller, 1992; Kerzner, 1987; Nixon et al., 2012)". There are times and places where leadership is useful (Hollenbeck et al., 2006)". Several studies have looked at the impact of project managers' leadership styles (transformational versus transactional) and leadership competencies (intellectual versus managerial versus emotional) on project outcomes (Geoghegan & Dulewicz, 2008; Müller et al., 2012; Müller & Turner, 2010a, 2010c)". However, the relation between project managers' people-oriented leadership abilities and successful projects has received little attention (Anantatmula, 2008; Anantatmula & Thomas, 2010; Fung & Howe, 2014)".

2.2.2 Leadership Competencies Importance

It has been found that effective leadership is essential for resolving workplace conflicts. A leader who can effectively provide feedback has already proven his worth. The goal of training programs is to equip participants with the knowledge and skills necessary to provide constructive feedback to employees in a way that will inspire them to develop and refine their talents. Leaders who score higher in emotional intelligence are more likely

to make sound choices (Haslam et al., 2017). Businesses that wish for long term success should provide their leaders with the skills required to lead their teams towards success.

2.2.3 Leadership Competencies of Project Manager

Effective project managers, as defined by the six characteristics established by Rees et al. (1996), tend to be highly intelligent and proficient at addressing problems. These characteristics are analogous to the intellectual competencies that Dulewicz & Higgs (2005b) listed as essential for a project manager.

Other characteristics described as behavioral or motivational abilities by Rees et al. (1996) include energy, skill-based attributes, and communication. They do not, however, promise that these characteristics directly boost project success. When appointing a project manager, Turner et al. (1988) highlighted the importance of the project manager's personal qualities, such as being proactive and take initiative. This viewpoint is comparable to that of Hogan et al. (2005) who believed that a managers' personality determines how effective they were as leaders. They do not, however, directly demonstrate the importance of personality traits in projects' success.

Pinto & Trailer (1998) found that a good project manager has the following traits.

- “Credibility”
- “Creative problem solving”
- “Tolerance for ambiguity”
- “Flexible management style”
- “Effective communication”

They also outlined the technical, administrative, and interpersonal abilities that project managers need to succeed such as planning, budgeting, etc.

The three competencies of project managers according to Kendra & Taplin (2004) are: “

- “Emotional Intelligence”
- “Cognitive Intelligence”
- “Social Intelligence”.

Velsor et al. (2010) at the Centre for Creative Leadership identified some of the human capabilities that motivate individuals to carry out leadership tasks such as setting direction, making commitment, aligning tasks, managing one’s thoughts and feelings, gauging actions which means leading oneself, and ultimately leading an organization. These skills include:

- “Leading oneself”
- “Self-Awareness”
- “Ability to balance conflicting demands”
- “Ability to learn”
- “Leading values”
- “Leading others”
- “Ability to build and maintain relationships”
- “Ability to build effective work groups”
- “Communications skills”

- “Ability to develop others”
- “Leading organizations”
- “Management skills”
- “Ability to think and act strategically”
- “Ability to think creatively and lastly”
- “Ability to initiate and implement change”

McShane & Glinow (2017) compiled a list of the top eight leadership qualities that have been shown to improve team output. “

- “Personality”
- “Self-Concept”
- “Drive”
- “Integrity”
- “Motivation”
- “Having sufficient Knowledge about the business”
- “Cognitive and practical intelligence”
- “Emotional Intelligence”

Four primary leadership qualities were identified by the Schroder High-Performance Leadership Competencies Model by Spangenberg et al. (2003). These are:

- “Thinking Capabilities”
 - Informational Capability
 - Conceptual Capability

- Strategic Capability
- Learning Capabilities
 - Developmental Capability
 - Interpersonal Learning
 - Cross-Boundary Learning
- Inspirational Capabilities
 - Purpose Building
 - Confidence Building
- Action Capabilities
 - Proactive Capability”

2.2.4 Leadership Competencies (Previous Studies and Findings)

A summary of previous studies on leadership competencies and their findings are below.

- **Study 1: “Do Project Managers' Leadership Competencies Contribute to Project Success”** (Geoghegan & Dulewicz, 2008).

Findings:

- There is a strong association between "solving problem" success variable and competencies in resource management, empowerment, development, and motivation.
- There is a strong link between the leadership qualities of resource management and empowerment and the achievement of goals within budget.

- **Study 2: “Leadership competencies for implementing planned organizational change”** (Battilana et al., 2010).

Findings:

- Managers' attention to mobilizing and evaluating actions related to planned organizational change implementation was found to be positively and significantly correlated with the presence of a national or regional leadership role, as measured by this study.
- **Study 3: “Influence of leadership competency and organizational culture on responsiveness and performance of firms”** (Asree et al., 2010).

Findings:

- The results show that responsiveness is positively related to leadership competencies and organizational culture.
- Furthermore, responsiveness correlates positively with hotel income. These results suggest that the leadership competency and organizational culture of a hotel are significant determinants in the hotel's response to its clients, which in turn would increase the hotel's income.
- **Study 4: “Determining the effects of attrition on leadership competency and organizational effectiveness: A quantitative study”** (Tanoe, 2010).

Findings:

- No statistically significant link between leadership skills and turnover was found.
- No correlation was found between employee turnover and productivity.

- In other words, the closer a leader is to retirement, the more effective they are likely to be for the organization as a whole, which implies that there is an inverse link between attrition rates and organizational effectiveness.
- **Study 5: “Leadership competency profiles of successful project managers”** (Müller & Turner, 2010b).

Findings:

- The results show that effective managers across all types of projects exhibit high levels of expression in three EQ subdimensions and one IQ subdimension.
- **Study 6: “The role of leadership competencies for implementing TQM: An empirical study in Thai manufacturing industry”** (Das et al., 2011).

Findings:

- The study underlines the importance of effective leadership from the top down to successfully adopt TQM. A company's ability to perform the nine TQM principles and turn out high-quality goods is directly correlated to the level of leadership competency in place.
- **Study 7: “Critical success factors in projects Pinto, Slevin, and Prescott - the elucidation of project success”** (Müller & Jugdev, 2012).

Findings:

- Pinto and his colleagues' original definitions, measuring scales, and dimensions, as well as their assessment procedures were found to be relevant and useful in the study of project success.

- **Study 8: “Leadership Competencies and Competitive Advantage: Empirical Study on Jordan Telecommunications”** (Management, 2012).

Findings:

- The research found that the competitive advantage of Jordanian telecommunications businesses in the Jordanian market was significantly impacted by leadership competencies and that there was a correlation between the two.
- Leadership in Jordan's telecom sector was found to be higher in line with international norms and to have adopted several prestigious American Management Association competencies, including those related to strategy formulation, effective communication, encouraging new ideas, and the cultivation of future leaders.
- **Study 9: “Role of leadership competencies and Team Social Capital in IT Service”** (Hyejung et al., 2013).

Findings:

- The level of success of a project is positively related to the level of emotional intelligence
- Project managers with high levels of social intelligence indirectly affect project success through their teams' social capital.
- Competencies of PM's cognitive intelligence have a direct impact on shorter projects, but an indirect impact on larger projects through the team's accumulated social capital.

- **Study 10: “Moderating effects of Organizational Culture on the Link between Leadership Competencies and Job Role Performance”** (Hamzah et al., 2008.)

Findings:

- The study's findings suggest that different elements of company culture moderate the connection between leadership skills and worker productivity.
- **Study 11: “Improving managerial performance: a study on entrepreneurial and leadership competencies”** (Jena & Sahoo, 2014).

Findings:

- The results of the study indicated that the know-how of business, competitive spirit, and leadership qualities were all substantial predictors of exemplary managerial performance.
- **Study 12: “The Relationship between Intellectual Capital and Project Managers competencies by using Structural Equation: CFA”** (Mirkamali et al., 2014).

Findings:

- According to the results of the poll, there is only a modest connection between intellectual capital and project manager competencies.
- **Study 13: “Leadership Competencies Profiles and Managerial Effectiveness in Greece”** (Trivellas et al., 2014.)

Findings:

- Findings showed that regardless of gender, managers with excellent job performance demonstrated excellence across the board in all leadership characteristics.
- Furthermore, the most significant contributions to managers' efficacy came from leadership skills linked with the role of innovator, director, and mentor.

CHAPTER 3 METHODOLOGY

According to Maylor et al. (2017), a research design is "a thorough strategy to perform a study" that translates one's research approach into specific procedures needed for the investigation. Study design, as defined by Enoch. Jowah (2011), is the plan for conducting the research necessary to answer the research question. Collaboration between researchers and participants is crucial for any valid study design (Welman, Kruger, & Mitchell (2007). According to Panneerselvam (2014), the study design serves as an all-encompassing manual for information gathering. Hence, this chapter explains on the steps that were taken to achieve the study's objectives. The conceptual model development, required data, collection of the data and data analysis are discussed in the following sections.

As the flowchart Figure 3.1 portrays, the aim was to investigate the effect of leadership competencies (LC) on project performance in the construction industry. The research began with an extensive literature review to understand the existing knowledge in the field and identify research gaps related to LC competencies. Based on the identified gaps, it was possible to develop a comprehensive LC framework and to design a questionnaire to collect data from industry professionals. The questionnaire was distributed to a diverse sample of participants, ensuring a wide range of perspectives.

Once the data was collected, The Partial Least Squares (PLS) analysis was employed to validate the LC model and analyze the findings. This process involved validating the measurement model, assessing the structural model, and examining both mediation and moderation effects. Through rigorous analysis, it was possible to refine the

initial LC framework and establish a final framework that accurately represents the relationship between leadership competencies and project performance in the construction industry.

In conclusion, the study delivers valuable insights into the critical role of leadership competencies in enhancing project performance within the construction sector. Based on the study's findings, the key takeaways are summarized and recommendations are made to industry practitioners and for future research. By implementing these recommendations, construction firms can develop more effective leaders and ultimately improve project outcomes.

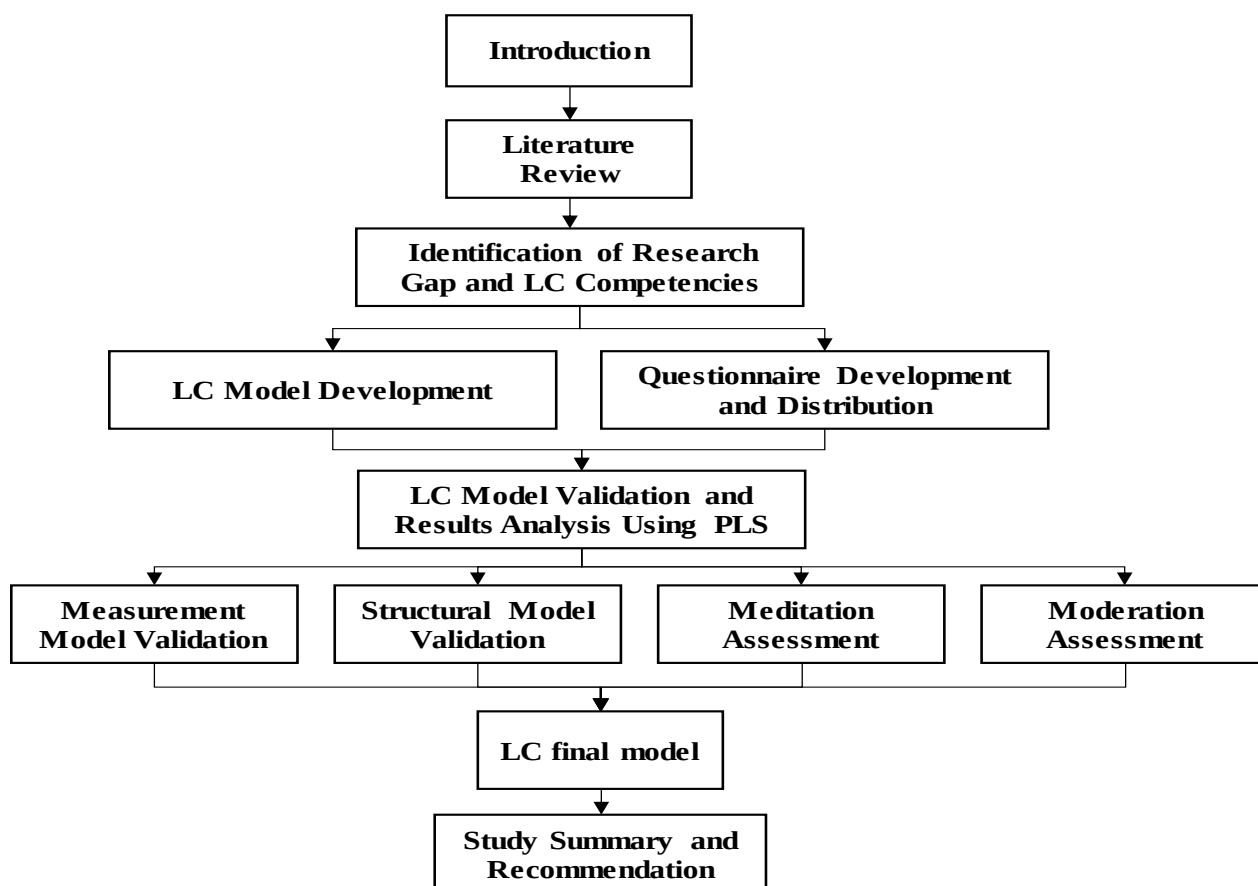


Figure 3. 1:Research Methodology

3.1 The Conceptual Model development

The acquired knowledge from the literature on variables can explain the phenomenon of leadership competency affecting the performance of construction projects. Besides, the literature also suggested the connections between these variables through many hypotheses and thus, draw a conceptual framework that shows the relationship of these variables. Figure 3.2 is a conceptual framework expressing the relationship between the project manager Leadership Competency and the project performance.

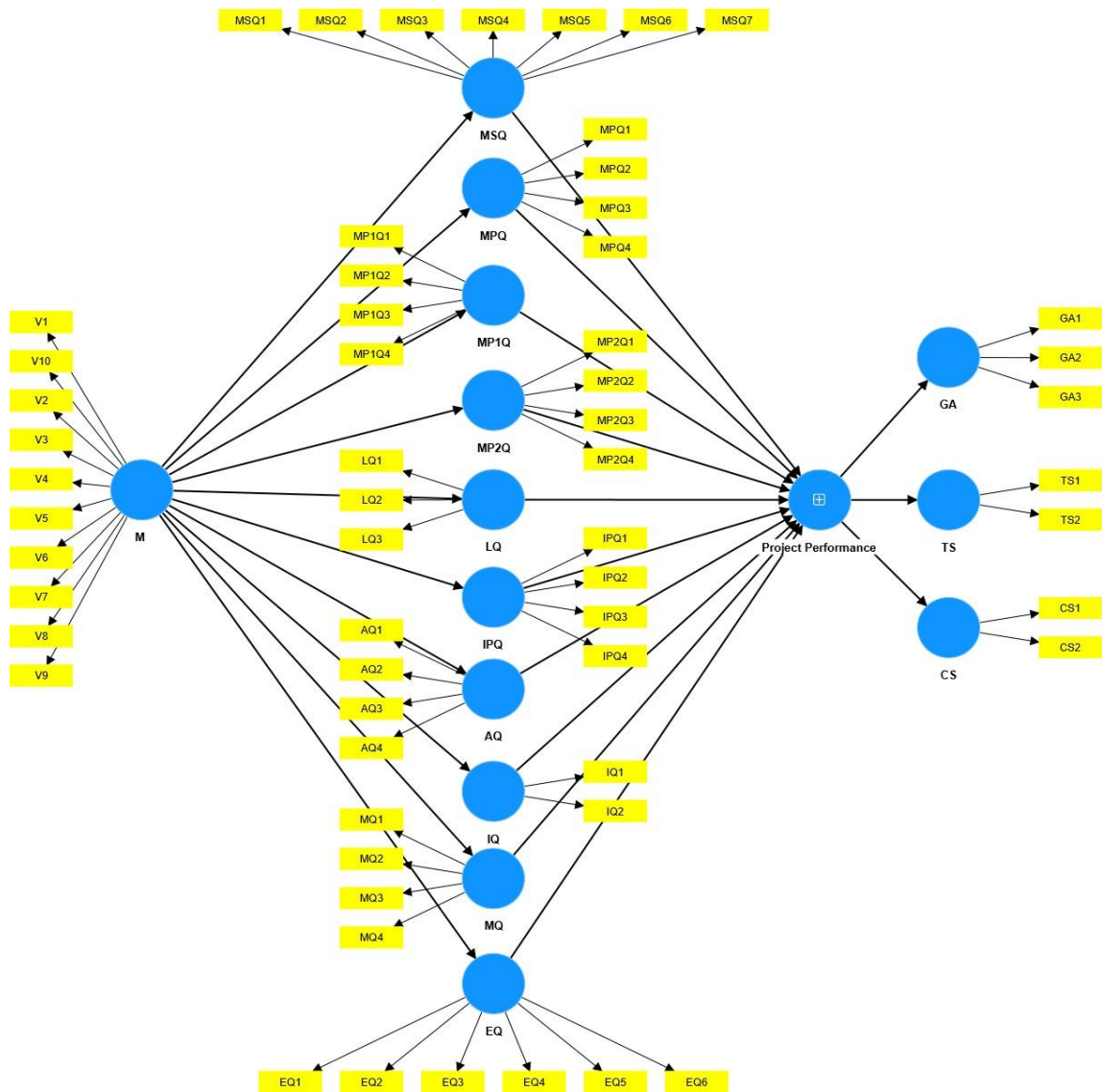


Figure 3. 2: Conceptual Framework including Mediators and its Variables.

3.2 Required Data

The research aims to answer how project manager leadership competencies affect projects performance through the developed conceptual framework, which defines the necessary data to achieve the set objectives. As portrayed in Figure 3.1, the following thirteen variables are hypothesized to evaluate the relationship between leadership competencies and project performance: Managing Self Quotient (MSQ), Managing People (MP1Q), Managing Programs (MP2Q), Leading Organizations (LQ), Intelligence Quotient (IQ) Managerial Quotient (MQ), Emotional Quotient (EQ), Administrative Quotient (AQ), Interpersonal Quotient (IPQ), Managing Projects Quotient (MPQ), Overall Goal Attainment (GA), Team Satisfaction (TS), Client/End-User Satisfaction (CS). Each of these constructs is referred to as a "Latent Variable" since it is measured by a series of questions that are reflective of it. The leadership competency is represented with mediators which may affect the project performance. Therefore, the following data was required:

3.2.1 Leadership Competency

The first independent variable (leadership competencies) is identified and measured using the literature review. After a comprehensive study of the literature, a total of ten leadership competencies (mediators) are selected. Each mediator contains variables which are measured by a five-point Likert scale to tap into the respondents' perceptions, ranging from value 1 (strongly disagree) to value 5 (strongly agree), used throughout the questionnaire.

A. Managing Self Quotient (MSQ)

Alsemgeest et al. (2017) defined “self-management as the behavior that an individual must adopt to see the desired change in his or her life and at the workplace”

B. Managing Projects Quotient (MPQ)

According to U.S. Office of Personnel Management (2019), project management is defined as “Knowledge of the principles, methods, or tools for developing, scheduling, coordinating, and managing projects and resources, including monitoring and inspecting costs, work, and contractor performance.”

C. Managing People (MP1Q)

U.S. Office of Personnel Management (2019) defined management people as “Plans, distributes, and monitors work assignments; evaluates work performance and provides feedback to others on their performance”.

D. Managing Programs (MP2Q)

According to U.S. Office of Personnel Management (2019), managing programs is defined as “Knowledge of the principles, methods, and tools for the coordinated management of a program to include providing oversight of multiple projects, integrating dependent schedules and deliverables, and related activities (for example, benefits management, life cycle management, program governance).”

E. Leading Organizations (LQ)

According to Upcounsel (2022), LQ is “The ability to solve problems, make decisions, manage changes, influence others, manage politics, innovate, take risks, set the vision and strategies, manage the work and goals, and understand the navigation of the business.”

F. Interpersonal Quotient (LPQ)

Interpersonal competency refers to an individual's capability to effectively communicate, interact, and build relationships with others in a given context. It encompasses a range of skills, including active listening, empathy, conflict resolution, and assertiveness, among others. Individuals with high levels of interpersonal competency are able to understand and respond to others' needs, perspectives, and emotions and are able to work collaboratively towards shared goals (Guo & Sanchez, 2005).

G. Administrative Quotient (LPQ)

Administrative competency is the set of knowledge, skills, and abilities required for effective management and administration of organizations, particularly in public or government settings. It includes competencies such as strategic planning, decision-making, problem-solving, communication, financial management, and human resources management. Administrative competency is essential for leaders and managers to navigate through complex organizational environments and achieve the goals and objectives of the organization (Sipes et al., 2016).

H. Intelligence Quotient (IQ)

Papalia et al. (2009) pointed that “the countless concepts of what intelligence is range from a genetically endowed, inborn, general capacity to develop a number of intellectual abilities to the ability to do a variety of specific things and to engage in rational, productive behavior and to whatever intelligence tests measure.”

I. Managerial Quotient (MQ)

“A collection of political, emotional and logical intelligence which cause the managers to behave effectively, including a collection of political, emotional and logical intelligence which cause the managers to behave effectively” (Hossein et al., 2016).

J. Emotional Quotient (EQ)

Mayer & Salovey (1990) defined Emotional Intelligence as “the subset of social intelligence that involves the ability to monitor one's own and other's feelings and emotions, to differentiate among them and to use this information to guide one's thinking and actions.”

Table 3.1 summarizes all Leadership Competencies, mediators and their variables utilized in this study.

Table 3. 1:Mediators and Their Variables

Mediators	Variables to Measure the Mediators
Managing Self Quotient (MSQ)	• Integrity/Honesty (MSQ1)
	• Interpersonal Skills (MSQ2)
	• Continual Learning (MSQ3)
	• Resilience (MSQ4)
	• Oral Communication (MSQ5)
	• Written Communication (MSQ6)
	• Flexibility (MSQ7)
Managing Projects Quotient (MPQ)	• Team Building (MPQ1)
	• Accountability (MPQ2)
	• Decisiveness (MPQ3)
Managing Projects Quotient (MPQ)	• Influencing / Negotiating (MPQ4)
Managing People (MP1Q)	• Leveraging Diversity (MP1Q1)
Managing People (MP1Q)	• Conflict Management (MP1Q2)
	• Public Service Motivation (MP1Q3)
	• Developing Others (MP1Q4)
	• Technology Management (MP2Q1)
Managing Programs (MP2Q)	• Financial Management (MP2Q2)
	• Partnering (MP2Q3)
	• Political Savvy (MP2Q4)
	• Vision (LQ1)
Leading Organizations (LQ)	• Strategic Thinking (LQ2)
	• Entrepreneurship (LQ3)
	• Broker (IPQ1)
Interpersonal Quotient (IPQ)	• Mentor (IPQ2)
	• Innovator (IPQ3)
	• Integrator (IPQ4)
	• Coordinator (AQ1)
Administrative Quotient (AQ)	• Director (AQ2)
	• Facilitator (AQ3)
	• Produce (AQ4)
	• Vision and imagination (IQ1)
Intelligence Quotient (IQ)	• Strategic perspective (IQ2)
	• Engaging Communication (MQ1)

Table 3. 2:Mediators and Their Variables (Continued)

Mediators	Variables to Measure the Mediators
Managerial Quotient (MQ)	• Developing (MQ2)
	• Achieving (MQ3)
	• Empowering (MQ4)
	• Emotional Resilience (EQ1)
Emotional Quotient (EQ)	• Intuitiveness (EQ2)
	• Interpersonal Sensitivity (EQ3)
	• Influence (EQ4)
	• Motivation (EQ5)
	• Conscientiousness (EQ6)

3.2.2 Project Performance

Project performance, according to Baccarini (1999), can be measured from several angles. For example, success may be defined as meeting or exceeding targets for technical performance, completing the project on time and within cost limits, or generating the anticipated financial return.

Table 3.2 includes all mediators and their variables utilized to measure the project performance.

Table 3. 3: Project Performance (Mediators and Variables)

Project Performance	Variables to Measure Project Performance
“Overall Goal Attainment (GA)	• “Timeliness (GA1)
	• Budgetary Compliance (GA2)
	• Quality (GA3)
Team Satisfaction (TS)	• Process Contentment (TS1)
	• Implementation Satisfaction (TS2)
Client/End-User Satisfaction (CS)	• Outcomes Satisfaction (CS1)
	• Project Specifications Fulfilment (CS2)

3.3 Data Collection

To begin, the researcher has reviewed previous research that examined how the independent variables of the study have impacted other projects. The researcher, then, validated the contents of the questionnaire with a panel of judges. As this is a quantitative study, the empirical data were collected and analyzed. Given the aim of this research, which is to validate and assess the suitability of the evaluation model, a quantitative survey was employed. The survey was ultimately distributed to both active and former members of the project team.

3.3.1 Data Source

The top management of grade 1 and grade 2 contractors located in the Eastern Province are the key informants for the necessary data. The Ministry of Municipalities and Urban Affairs and Housing (MOMRAH) indicates that there are 63 contractors categorized as grade1 and 2 within the Eastern Province of Saudi Arabia. MOMRAH classifies contractors into five grades. The given grade sets a certain maximum financial value of a project for contractors to bid. The maximum upper limits for Grades 1 through 5 are greater than SR 280 million, SR 280 million, SR 70 million, SR 21 million, and SR 7 million, respectively.

3.3.2 Tools

This study utilized the survey research method to collect the required data from the key informants in grades 1 and 2 contractors. A questioner was developed as a tool to collect the necessary data. To attain the goals, a quantitative research methodology was employed in the form of a questionnaire. Quantitative research approaches, as argued by Harwell

(2011) have the advantages of being easily repeatable, producing generalizable results, and are interesting for making predictions. Grahn et al. (2006) argues that a quantitative method involves playing around with numbers. Therefore, this chapter presents the steps that are taken to achieve the objective of the study. The required data, data collection, and data analysis are discussed in the following sections. The developed questioner consisted of two parts. The first part was devoted to collecting data related to the biography of the participants namely, age, gender, level of experience, education level, job title etc. The second part was reserved to ask the indication of the participants about statements related to leadership traits mentioned in sub-section 3.1.2. For this a google form was created and sent to contractors via WhatsApp and e-mail.

3.3.3 Population and Sample Size

The population of the study is the Grades 1 and 2 contractors in the Eastern Province of Saudi Arabia. According to the Ministry of Municipal and Rural Affairs, these two grades have 63 registered contractors in Eastern Province of Saudi Arabia based on their annual yearly report posted in 2018. Since, the number of contractors was limited and reachable, a consideration of all of them as a population of the research was utilized. The minimum number of contractors that are representatives of the population was determined using the following formula (Kish, 1995):

$$n_o = \frac{p * q}{v^2}$$

$$n = \frac{n_o}{1 + \frac{n_o}{N}}$$

Where:

n_0 : Sample size's first estimate.

p : The proportion of the characteristic being measured in the target population.

q : $1-p$

v : The maximum allowable percentage of standard error.

N : The population size.

n : The sample size.

To obtain the representative size of population, the value for both " p " and " q " was taken as 0.5. Furthermore, 10% ($v=0.1$) was the maximum standard error allowed in this study. Having a population of 63 contractors and applying the previous formula showed that the minimum representative contractors needed for this study are 24 contractors.

3.3.4 Data Analysis

The collected data was used to assess the validity of conceptual framework through many statistical tools as shown in Figure 4.1. This study employed the Partial Least Square Structural Equation Modeling (PLS-SEM) and used Smart PLS software to obtain the desired statistical measures. This method was chosen for the following reasons:

1. Smart PLS is used for the analysis of the measurement and structural models, which shows that it brings accurate estimations of the paths among variables (Ringle et al., 2012).

2. Smart PLS is an apt statistical technique for analysis of complex relations, exploratory studies, and to test moderation effects (Ringle et al., 2012).
3. Researchers e.g., Bjorvatn & Wald (2018), Chileshe et al. (2018), Khosravi et al. (2020), Klaijnsen et al. (2017), Lindner & Wald (2011) and Yun et al. (2014) have used this approach widely in project management studies to test complex relationships.

Figure 3.3 presents the various analysis and measurements that were performed on collected data.

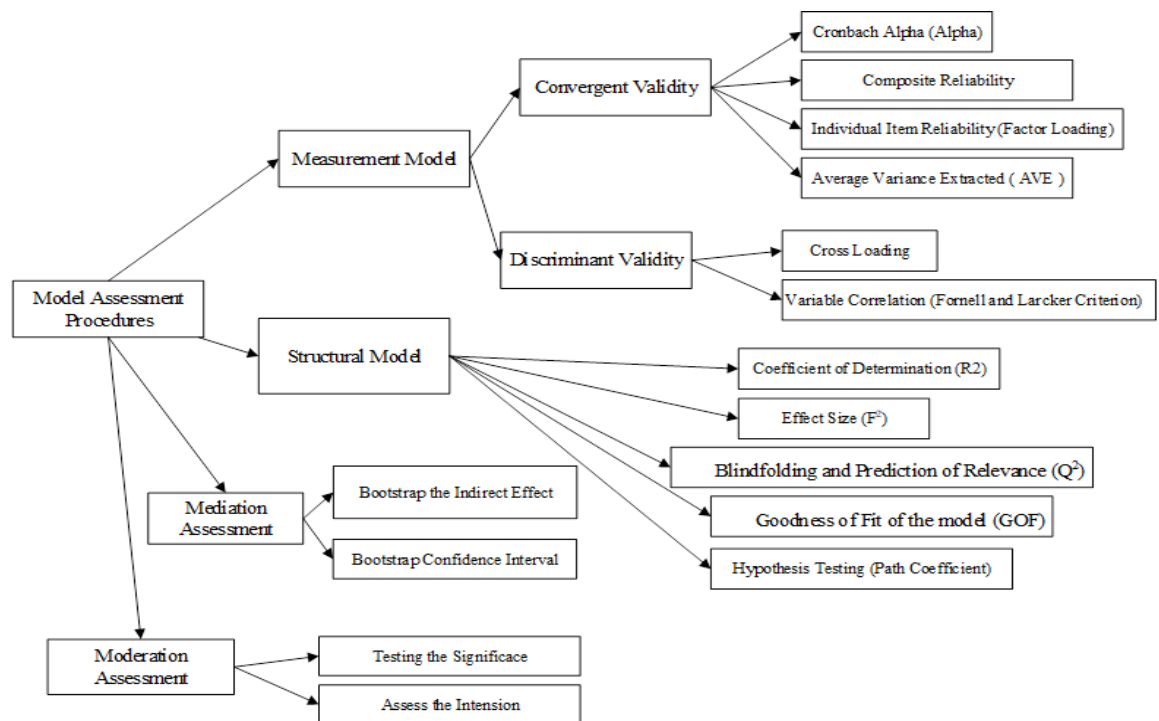


Figure 3.

Figure 3. 3: Model Validation Process According to PLS Software

CHAPTER 4 RESULTS ANALYSIS

4.1 Overview

The aim of this study is to find how leadership competencies impact project performance in the construction industry. To ensure an adequate response rate from the sample for this research, the questionnaire was distributed in January 2023 to designated personnel in 63 grade 1 and grade 2 contractors located within the Eastern province of Saudi Arabia; which was the total number of such contractors in the area. The designated personnel were asked to direct the questionnaire to the most appropriate person in the organization to complete and return. Some designated personnel received more than one questionnaire with a request to direct them to more qualified professionals. A total of 80 questionnaires were shared with the designated personnel. The designated personnel were asked to share the questionnaire with experts in their organizations. In order to increase participation, a regular follow up with the designated personnels through emails and WhatsApp reminder messages was made. A total of 68 filled questionnaires were received, which means that more than one response was received from some contractors, resulting in an 85% response rate. After screening the received completed questionnaires for completeness and quality of responses, five questionnaires were deemed incomplete, and were eliminated, resulting in a total of 63 valid responses from unique respondents. The data was then validated and analyzed using PLS software. Further details about the validation process and research findings are presented in subsequent sections.

4.2 Characteristics of Respondents

Table 4.1 displays the general characteristics of the participants in this study, providing information on their demographics, frequencies, and percentages. The table is divided into several dimensions, including gender, age, educational level, job title, department, experience, company field, average project size, and average project duration. Each dimension has multiple categories along with the number of participants listed in each category.

For example, the gender dimension has two categories: male and female. Out of the 68 total participants, 62 (98%) are male, and only 1 (2%) is female. The age dimension has four categories, with the highest percentage of respondents falling between the ages of 30 and less than 40 (25 or 40%). The educational level dimension has five categories, with most respondents holding BSc degrees (35 or 56%).

In the job title dimension, majority respondents are project engineers (20 or 32%), next project managers (9 or 13%), general managers (6 or 9%), project directors (3 or 4%), and other categories (40%). The department dimension has five categories, with most respondents working in the engineering department (30 or 48%).

The experience dimension has four categories, with the majority of respondents having 15 years of experience or greater (23 or 37%), followed by 5 to less than 10 years of experience (20 or 32%). In the company field dimension, most respondents are working in oil and gas (16 or 25%).

The average project size dimension has five categories, with most projects ranging from 150 million to less than 200 million (28 or 44%). The average project duration

dimension also has five categories, with most projects ranging from 3 years to less than 5 years (18 or 29%). The results indicate that the data was collected from renowned, competent and experienced experts of project management. Hence, the collected data is sound, credible and trustworthy.

Table 4. 1: Characteristics of Respondents

Dimension		Frequency	Percent %
Gender	Male	62	98
	Female	1	2
Total		63	100
Age	20 to less than 30	8	13
	30 to less than 40	25	40
	40 to less than 50	10	16
	50 Years or greater	20	32
Total		63	100
Educational Level	High School or Diploma	0	0
	BSc	35	56
	Master or High Diploma	21	33
	PhD	7	11
	Other	0	0
Total		63	100
Job title	Project Engineer	20	32
	Project Director	3	4
	Project Manager	9	13
	General Manger	6	9
	Other	25	42
Total		63	100

Table 4. 2: Characteristics of Respondents (continued)

Dimension		Frequency	Percent %
Department	Administrative / Customer Care	2	3
	Financial	0	0
	Technical	2	3
	Engineering	30	48
	Other	29	46
Total		63	100
Experience	Less than 5 Years	15	24
	From 5 – Less than 10 Years	20	32
	From 10 – Less than 15 Years	5	8
	15 Years or greater	23	37
Total		63	100
Company Field	Oil and Gas	16	25
	High rise buildings	2	3
	Infrastructural	4	6
	Steel structures	2	3
	Other	39	62
Total		63	100
Average Project Size (Contract Value in Saudi Riyals)	Less than 50 million	18	29
	50 million to Less than 100 million	10	16
	100 million to Less than 150 million	7	11
	150 million to Less than 200 million	28	44
	200 million or greater	0	0
Total		63	100

Table 4. 3: Characteristics of Respondents (continued)

Dimension		Frequency	Percent %
Average Project Duration (Years)	Less than 3	15	24
	3 to less than 5	18	29
	5 to less than 7	13	21
	7 to less than 10	13	21
	10 or greater	4	6
Total		63	100

4.3 Model Assessment and Validation

This section is dedicated to explaining the validation of the developed model using Smart PLS software that revolutionized latent variable modeling. It combines advanced approaches (PLS-POS, IPMA, sophisticated bootstrapping processes) with an intuitive graphical user interface. Figure 4.2 represents the conceptual framework of the developed model constructed using Smart PLS software for validation purposes.

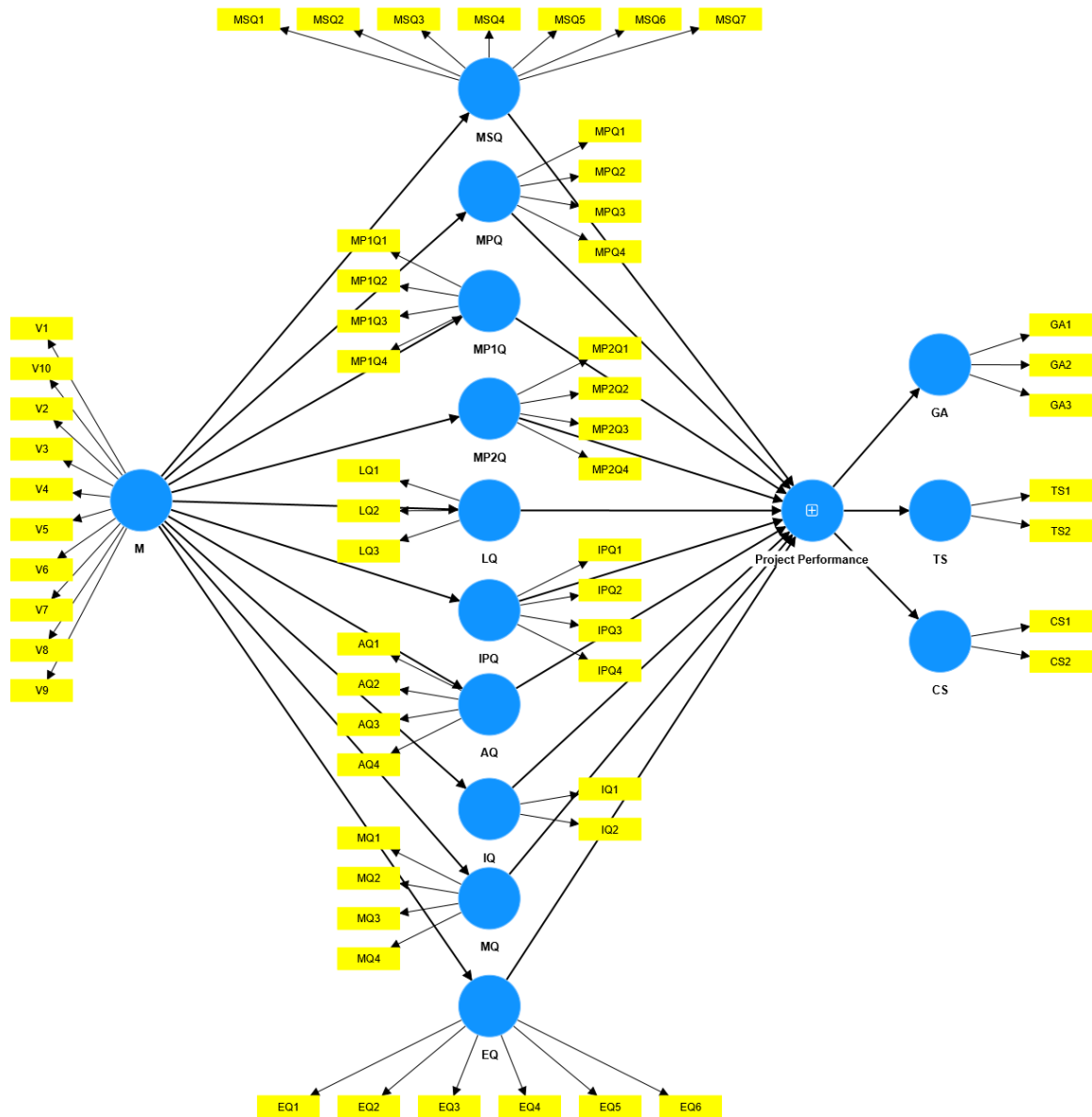


Figure 4. 1: Model Conceptual Framework including Mediators and its Variables.

Each of these factors is referred to as a "Latent Variable" in the Smart PLS program since it is measured by a series of questions that are reflective of it rather than by itself. For instance, the questionnaire in Appendix A contains questions that show how each latent variable of leadership competencies is measured. All participants responded to these questions with a number between 1 and 5, which corresponds to the statements 1 "strongly

disagree", 2 "disagree", 3 "neutral", 4 "agree", 5 "strongly agree". The term "Measured Variable" refers to each item from the set of surveys that together form the latent variable. The proposed conceptual framework will investigate the relationship between a group of measurable variables (Questions), which are represented in the framework as an arrow and are referred in Smart PLS as "Loading". Overall, to have a valid and dependable framework, we must identify the convergent and discriminate validity for the measurement model, as suggested by Hair (2012), the programmer of the Smart PLS. The structural model, mediation role and moderation role—all of which are discussed in more detail in the next subsections are then evaluated. The titles and assessments presented in Figure 3.2 serve as a road map to the subsequent sections, which provide further theoretical details on the validation process.

4.3.1 Assessment of Measurement Model

As can be seen from Figure 4.3, the evaluation of the measurement model is conducted in two phases. First, "Convergent Validity" reflects how close the provided questions are with each other. Second, "Discriminate Validity" measures how far the proposed questions are from each other. Before diving deep into the aforementioned terms, it is important to understand the definition of validity and reliability. For simplicity, it is assumed that five data are collected from the questions. These data are shown as bold dot (.) on Figure 4.5 and their average represented as cross (x). If the cross (average value of the questions) is located at the center of the bull's eye as shown in the top right of Figure 4.5, the used questions are called valid. Otherwise, it can be implied that the questions cannot be used to assess the target variables. To further elaborate, imagine measuring

someone's height using a scale of weight, which is definitely not a proper measurement method.

The Smart PLS program automatically calculates the average value of each question by averaging the responses to the questions that have been inserted into the program. The target center value is a criterion provided by the PLS developer that is based on a large body of statistical research. It's important to mention that if a non-valid result is produced where the average does not satisfy the criteria specified in the test (target center), simply some questions are deleted until the targeted average is achieved. If the latter procedure did not shift the data toward the targeted average, then it can be concluded that the questions are invalid.

Reliability, on the other hand, isn't concerned with hitting the bull's eye, rather with how near the measurements (the data acquired via questions) are to the mean value (cross). As depicted by the lower bottom of Figure 4.3, the upper and lower limits are not in the perfect spot, indicating that they are invalid. However, the data is still considered reliable because it is distributed around the average in the upper left corner of Figure 4.3. By observing how far off the data is from the target, its invalidity may readily be ascertained. Assessing reliability is the first stage in checking validity. If the measurements are unreliable, the result cannot be trusted.

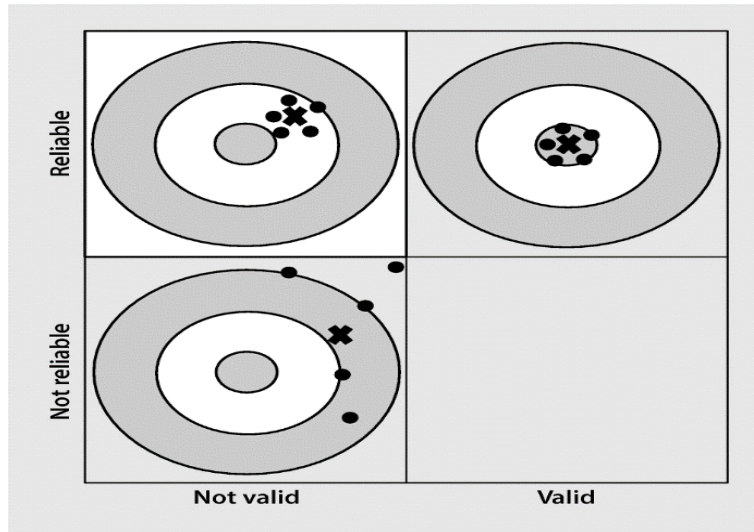


Figure 4. 2: Reliability and Validity Explanation (Mooi & Sarstedt, (2011))

A. Convergent Validity

According to Hair et al. (2011), the convergent validity is defined as “the extent to which a measure correlates positively with alternative measures of the same latent variable”. PLS software offers four different methods for measuring convergent validity; Individual item reliability, Cronbach alpha, Average variance extracted, and Composite reliability. These are explained as follows:

- **Cronbach Alpha**

In 1951, Lee Cronbach developed Cronbach's alpha coefficient which evaluates the internal consistency or dependability of a group of survey questions. This statistic is utilized to find out if a group of items consistently evaluate the same characteristic. Cronbach's alpha measures the level of agreement on a standardized 0 to 1 scale. Higher numbers indicate higher level of agreement among the items. High Cronbach's alpha values propose that the responses are consistent across a group of questions. For example, when respondents respond highly to one question, they are likely to respond highly to the other

questions also. This consistency indicates that the measurements are accurate and the items may evaluate the similar characteristics.

In contrast, low scores suggest that the set of items does not measure the same construct in a reliable manner. High responses to a single question are not indicative of the participants' assessments on the remaining items. Due to the unreliability of the measurements, it is highly improbable that the questions measure the same characteristic.

Cronbach's alpha equation, presented below, is used to measure three main statistics namely; precision lower coefficient, spilt-half coefficients mean, and first factor upper bound concentration.

$$\alpha = \frac{n}{n-1} \left(1 - \frac{\sum_i V_i}{V_t} \right)$$

Where:

n: questions number

V_i : individual measure variance

V_t : total score variance

The criteria to evaluate the value of (α) is provided in Table 4.2

Table 4. 4: Criteria to Evaluate the Value of (α)

Cronbach's Alpha	Internal Consistency Criteria
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Table 4.3 and Figure 4.4 presents the Cronbach's alpha coefficients for variety of constructs in the study. Cronbach's alpha measures internal consistency reliability, indicating how well the items measuring a construct are interrelated. The commonly accepted threshold for an acceptable level of Cronbach's alpha is 0.70 or above.

In this study, the Cronbach's alpha values for all constructs are above the acceptable threshold, indicating a good level of internal consistency reliability. Specifically, the Cronbach's alpha values range from 0.791 to 0.983, with the highest value being for Project Performance PP (0.983), and the lowest value being for Intelligent Quotient IQ (0.71).

The constructs can be grouped into three categories based on their Cronbach's alpha values. The first category includes constructs with high level of internal consistency reliability, with Cronbach's alpha values above 0.85. This includes Customer Satisfaction, CS (0.878), Emotional Quotient, EQ (0.869), Goal Attainment Quotient, GA (0.799), Interpersonal Quotient, IPQ (0.86), Leading Organization Quotient, LQ (0.81), Managing

People Quotient, MP1Q (0.895), Managing Project Quotient, MPQ (0.885), Managerial Quotient, MQ (0.864), and Managing Self Quotient, MSQ (0.928). The second category includes constructs with a moderate level of internal consistency reliability, where Cronbach's alpha values range between 0.70 and 0.85. This includes Intelligent Quotient, IQ (0.71) and Administrative Quotient, AQ (0.791). The third category includes only one construct; Project Performance PP, with an extremely high level of internal consistency reliability with a Cronbach's alpha value of 0.983.

Overall, the high Cronbach's alpha values for most of the hypotheses suggest that the measures used in this study have a good level of internal consistency reliability, which enhances the credibility of the study's results.

Table 4. 5: Values of Cronbach's Alpha (α)

Construct	Cronbach's alpha
Administrative Quotient (AQ)	0.791
Client/End-User Satisfaction (CS)	0.878
Emotional Quotient (EQ)	0.869
Overall Goal Attainment (G)	0.799
Interpersonal Quotient (IPQ)	0.86
Intelligence Quotient (IQ)	0.71
Leading Organizations (LQ)	0.81
Leadership Competencies (LC)	0.914
Managing People (MP1Q)	0.895
Managing Programs (MP2Q)	0.836
Managing Projects Quotient (MPQ)	0.885
Managerial Quotient (MQ)	0.864
Managing Self Quotient (MSQ)	0.928
Project Performance (PP)	0.983
Team Satisfaction (TS)	0.878

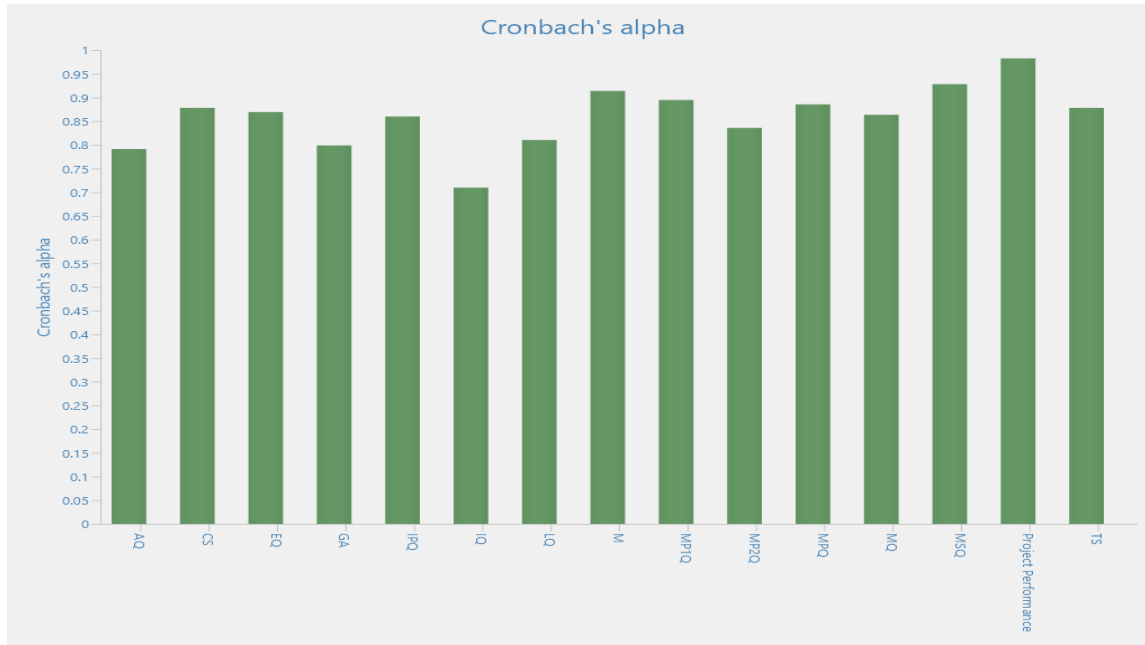


Figure 4. 3: Values of Cronbach's Alpha (α)

- **Composite Reliability**

Composite reliability (CR) is very much similar to Cronbach's alpha method of measuring internal variable consistency. Put differently, CR reflects overall reliability of the set measured variable through combining the measured variable covariance and variance and divide by overall composite sum of the measured variable, in addition to error term variance.

The CR factor has a range of 0 to 1, with a higher value indicating greater validity. When the value is less than 0.6, the measured variable is believed to be unreliable. CR formula is shown below (Bacon et al., 1995).

$$\frac{(\sum_{i=1}^p \lambda_i)^2}{(\sum_{i=1}^p \lambda_i)^2 + \sum_{i=1}^p V(\delta)}$$

Where:

λ_i : ith measured variable completely standard loading

$V(\delta)$: ith measured term error variance

p : measured variable number.

- **Individual Item Reliability (Factor Loading)**

Factor loading (FL) (The value shown on the model arrow) is found in a structure or factor pattern matrix. FL signifies the correlation coefficient between the latent variable and the measured variable. The greater the value, the greater the reliability. If the result falls between 0.4 and 0.7, it is deemed unreliable. Steps outlined in Figure 4.5 shall be followed to determine whether or not to keep the question (measured variable) in the model.

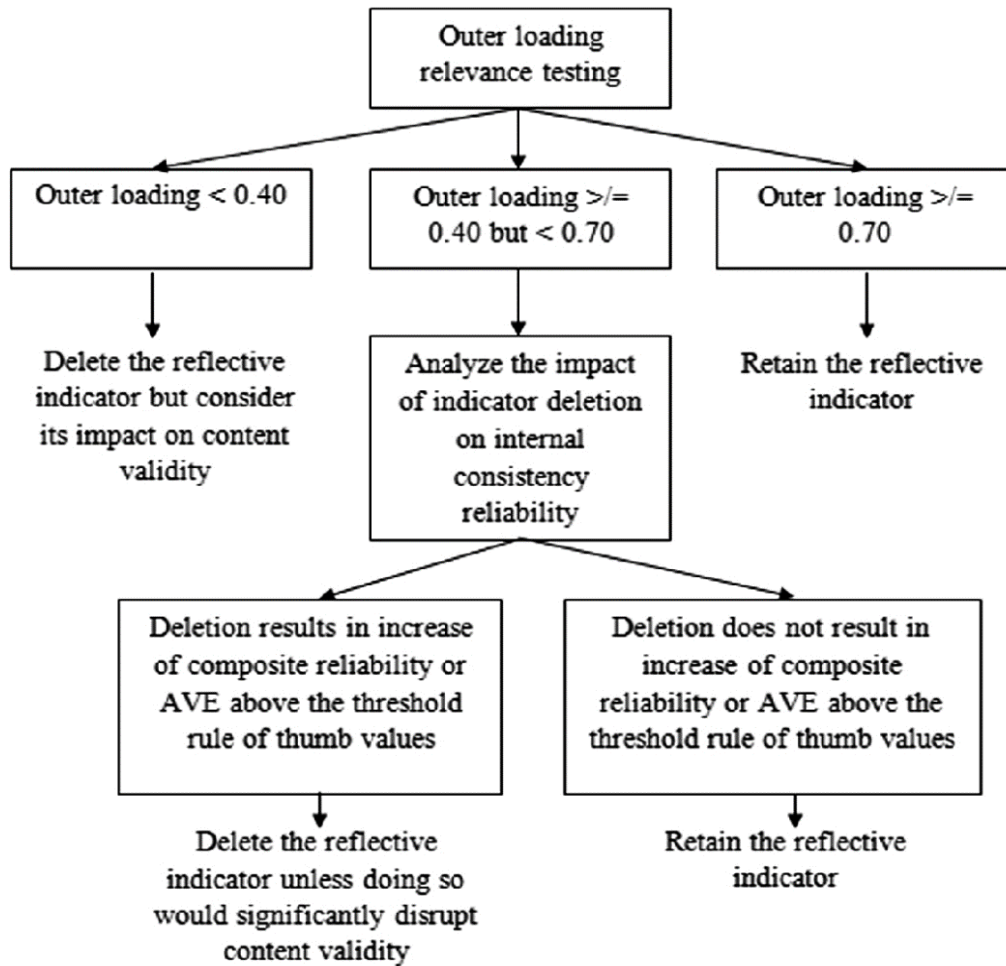


Figure 4. 4: Criteria Whether or not to Keep the Question (Measured Variable) in the Model.

In PLS software, two types of composite reliability, rho_a and rho_c are used to evaluate internal consistency or credibility of the survey items, that measure a construct or a latent variable.

Table 4.4 and Figures 4.6 & 4.7 show the composite reliability values for the constructs measured by the survey. The table reports two different measures of composite validity, rho_a and rho_c, for each construct.

The first measure, rho_a, is the traditional measure of composite reliability in PLS-SEM, which is based on the average variance extracted (AVE) of the construct and the

factor loadings of its items. The second measure, rho_c, is an alternative measure of composite reliability that considers the cross-loadings of the items on other constructs.

The table 4.4 shows that the constructs have relatively high levels of composite reliability, with most values above 0.8 for both rho_a and rho_c. This indicates that the survey items measuring each construct are internally consistent and reliable. However, some constructs, such as AQ and IQ, have lower levels of composite reliability, particularly for rho_a. This suggests that the items measuring these constructs may need further refinement or revision to improve their reliability. On the other hand, constructs such as PP and MSQ have very high levels of composite reliability, indicating that the survey items measuring these constructs are highly reliable.

Table 4. 6: Composite Reliability Values

Construct	Composite reliability (rho_a)	Composite reliability (rho_c)
Administrative Quotient (AQ)	0.794	0.864
Client/End-User Satisfaction (CS)	0.879	0.943
Emotional Quotient (EQ)	0.878	0.902
Overall Goal Attainment (G)	0.806	0.881
Interpersonal Quotient (IPQ)	0.866	0.905
Intelligence Quotient (IQ)	0.739	0.872
Leading Organizations (LQ)	0.822	0.888
Leadership Competencies (LC)	0.916	0.928
Managing People (MP1Q)	0.898	0.927
Managing Programs (MP2Q)	0.838	0.89
Managing Projects Quotient (MPQ)	0.89	0.921
Managerial Quotient (MQ)	0.891	0.907
Managing Self Quotient (MSQ)	0.931	0.942
Project Performance (PP)	0.984	0.983
Team Satisfaction (TS)	0.879	0.943

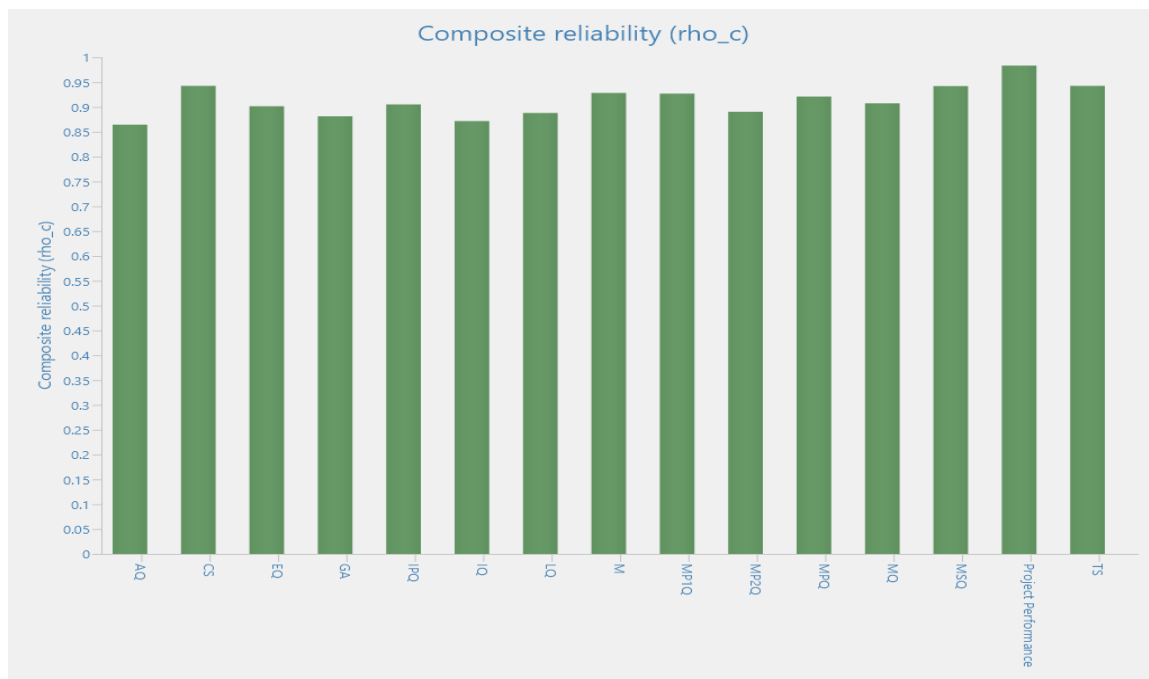


Figure 4. 5: Composite Reliability rho_a

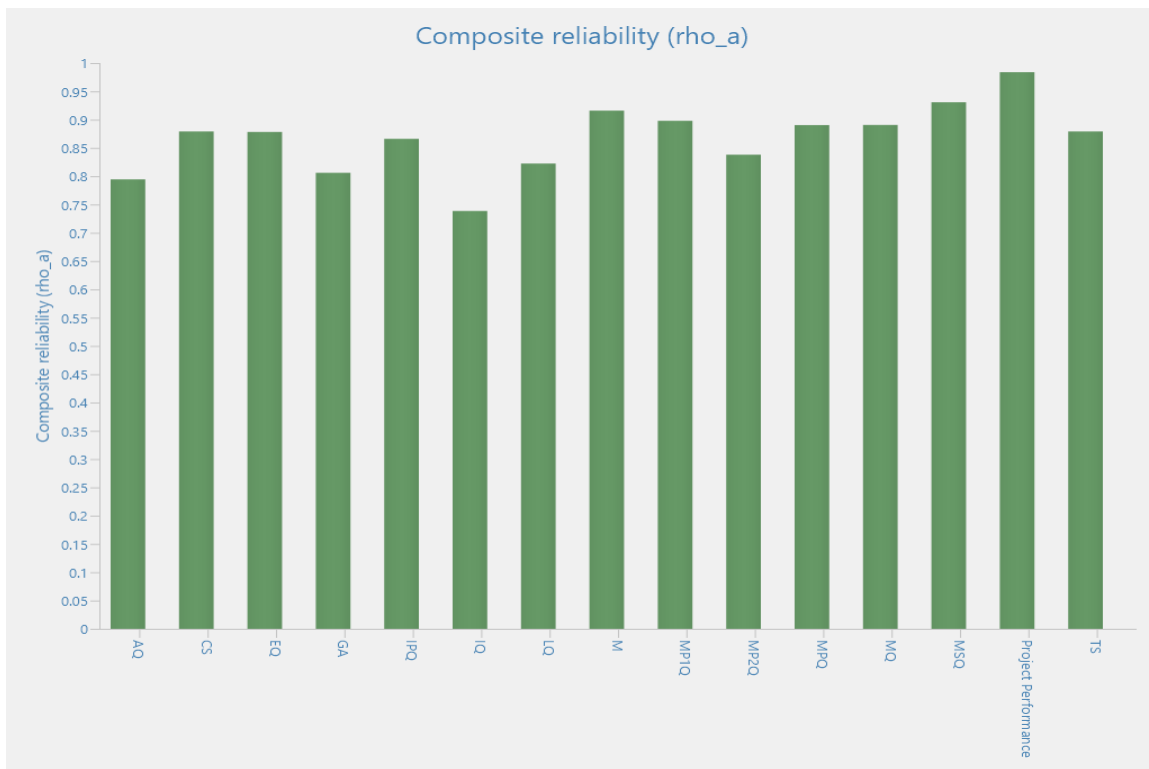


Figure 4. 6: Composite Reliability rho_c

- **Average Variance Extracted (AVE)**

Mean values of square loading divided by the number of the measured variable can be used to express the “Average Variance Extracted” (AVE), which calculates the level of variance expressed by latent variable against the level of measurement error. When the value is less than 0.5, the measured variable is considered to be unreliable.

AVE formula is presented below:

$$AVE = \frac{\sum_{i=1}^k \lambda_i^2}{(\sum_{i=1}^k \lambda_i^2 + \sum_{i=1}^p Var(e_i))}$$

Where:

K: latent variables indicator number

λ : factor loading

e_i : kth indicator of error variance

Based on the results provided by PLS software (Table 4.5 & Figure 4.8), the AVE values for all the constructs are above the acceptable threshold of 0.5, indicating good convergent validity. The highest AVE value is for CS (0.891), followed by TS (0.891), suggests that these constructs have the highest amount of variance explained by their respective indicators.

The constructs with the lowest AVE values are PP (0.536) and LC (0.565), which still meet the minimum threshold of 0.5 but are on the lower end. It is important to note that constructs with low AVE values may indicate a lack of convergent validity, and

researchers should further examine the indicators and consider removing them if they do not adequately measure the latent construct.

Overall, the high AVE values for most of the constructs in the table suggest that the indicators used to measure the constructs are reliable and valid, which supports the findings of the study. Table 4.6 summarize the PLS Convergent Validity Results

Table 4. 7: Average Variance Extracted (AVE) Values

Construct	Average variance extracted (AVE)
Administrative Quotient (AQ)	0.615
Client/End-User Satisfaction (CS)	0.891
Emotional Quotient (EQ)	0.605
Overall Goal Attainment (G)	0.712
Interpersonal Quotient (IPQ)	0.705
Intelligence Quotient (IQ)	0.773
Leading Organizations (LQ)	0.726
Leadership Competencies (LC)	0.565
Managing People (MP1Q)	0.761
Managing Programs (MP2Q)	0.67
Managing Projects Quotient (MPQ)	0.745
Managerial Quotient (MQ)	0.712
Managing Self Quotient (MSQ)	0.7
Project Performance (PP)	0.536
Team Satisfaction (TS)	0.891

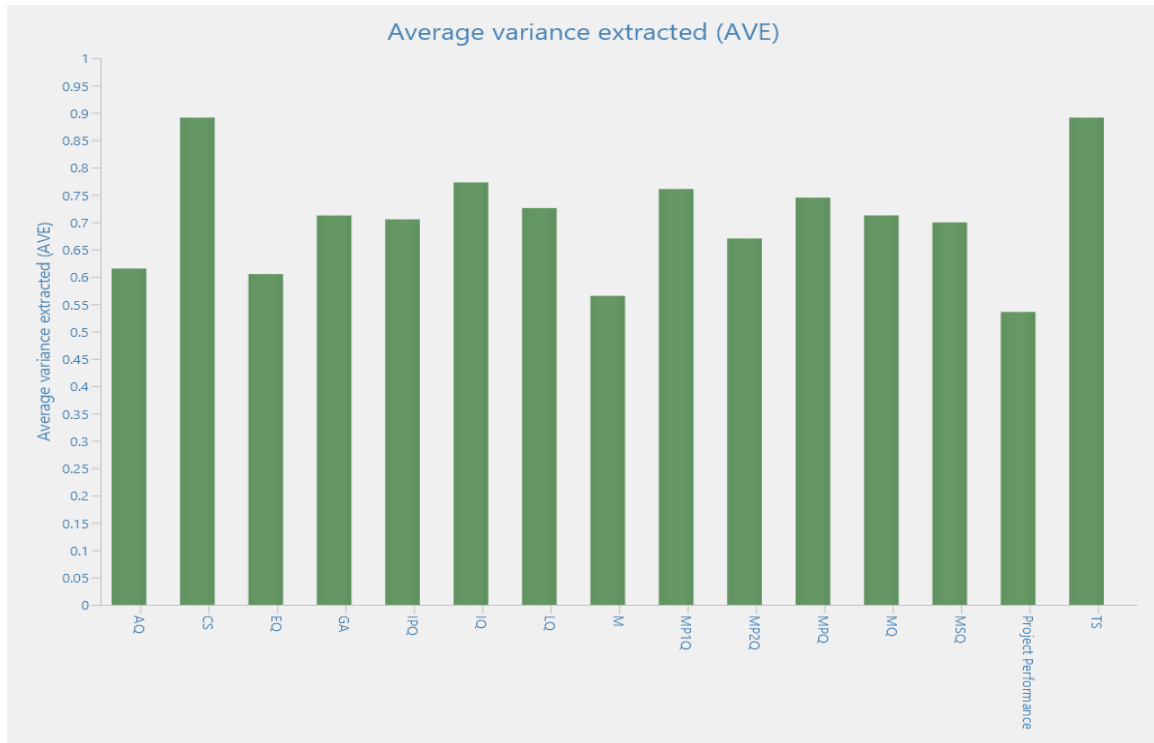


Figure 4. 7: Average Variance Extracted (AVE)

Table 4. 8: Convergent Validity Results

Constructs (Latent Variable)	Item (Indicator)	Loading	Alpha (α) (> 0.7)	CR (> 0.7)	AVE (> 0.5)
Leadership Competency (LC)	V1	0.642	0.914	0.916	0.565
	V2	0.751			
	V3	0.753			
	V4	0.793			
	V5	0.758			
	V6	0.73			
	V7	0.735			
	V8	0.835			
	V9	0.774			
	V10	0.731			
Managing Self Quotient (MSQ)	MSQ-1	0.859	0.859	0.931	0.7
	MSQ -2	0.839			
	MSQ -3	0.843			
	MSQ -4	0.826			
	MSQ -5	0.769			
	MSQ -6	0.863			
	MSQ -7	0.851			

Table 4. 9: Convergent Validity Results (**Continued**)

Constructs (Latent Variable)	Item (Indicator)	Loading	Alpha (α) (> 0.7)	CR (> 0.7)	AVE (> 0.5)
Managing Projects Quotient (MPQ)	MPQ -1	0.87	0.885	0.89	0.745
	MPQ -2	0.916			
	MPQ -3	0.836			
	MPQ -4	0.828			
Managing People (MP1Q)	MP1Q -1	0.887	0.895	0.898	0.761
	MP1Q -2	0.865			
	MP1Q -3	0.827			
	MP1Q -4	0.908			
Managing Programs (MP2Q)	MP2Q -1	0.826	0.836	0.838	0.67
	MP2Q -2	0.803			
	MP2Q -3	0.849			
	MP2Q -4	0.796			
Leading Organizations (LQ)	LQ -1	0.846	0.81	0.822	0.726
	LQ -2	0.905			
	LQ -3	0.802			
Interpersonal Quotient (IPQ)	IPQ -1	0.796	0.86	0.866	0.705
	IPQ -2	0.798			
	IPQ -3	0.862			
	IPQ -4	0.898			
Administrative Quotient (AQ)	AQ -1	0.749	0.791	0.794	0.615
	AQ -2	0.859			
	AQ -3	0.774			
	AQ -4	0.75			
Intelligence Quotient (IQ)	IQ -1	0.848	0.71	0.739	0.773
	IQ -2	0.909			
Managerial Quotient (MQ)	MQ -1	0.852	0.864	0.891	0.712
	MQ-2	0.901			
	MQ-3	0.911			
	MQ -4	0.693			
Emotional Quotient (EQ)	EQ -1	0.798	0.869	0.878	0.605
	EQ1 -2	0.752			
	EQ -3	0.69			
	EQ -4	0.801			
	EQ -5	0.845			
	EQ -6	0.771			
Project Performance (PP)	CS1	0.946	0.983	0.984	0.536
	CS2	0.942			
	TS1	0.946			
	TS2	0.942			
	GA1	0.861			
	GA2	0.819			
	GA3	0.851			

B. Discriminate Validity

- **Fornell and Larcker Criterion**

When convergent validity was evaluated using AVE, it was discovered that it could also capture discriminating validity by using the square root of the value, which was later called the Fornell and Larcker Criterion. This criteria functions as a matrix, with the upper limit of the matrix representing each variable which must be greater than other variables in order to be valid. In other words, when the value of a latent variable itself is greater than the values of all other variables by themselves, it indicates that the variable is unique and qualifies to be included in the model.

Table 4.7 reflects the results of the Fornell and Larcker Criterion analysis, which is used to assess the discriminant validity of the constructs in a model. The diagonal values in the table represent the square root of the Average Variance Extracted (AVE) for each construct, while the off-diagonal values signify the correlations between constructs.

Table 4. 10: Fornell and Larcker Criterion analysis

Construct	AQ	CS	EQ	GA	IPQ	IQ	LQ	MP1Q	MP2Q	MPQ	MQ	MSQ	PP	TS
Administrative Quotient (AQ)	0.784													
Client/End-User Satisfaction (CS)	0.542	0.944												
Emotional Quotient (EQ)	0.643	0.749	0.838											
Overall Goal Attainment (G)	0.542	0.672	0.687	0.870										
Interpersonal Quotient (IPQ)	0.612	0.646	0.612	0.562	0.888									
Intelligence Quotient (IQ)	0.729	0.711	0.681	0.576	0.644	0.879								
Leading Organizations (LQ)	0.614	0.687	0.722	0.503	0.720	0.767	0.862							
Leadership Competencies (LC)	0.572	0.610	0.660	0.591	0.691	0.727	0.712	0.893						
Managing People (MP1Q)	0.581	0.735	0.714	0.632	0.689	0.743	0.739	0.712	0.854					
Managing Programs (MP2Q)	0.646	0.628	0.688	0.576	0.615	0.703	0.621	0.743	0.676	0.896				
Managing Projects Quotient (MPQ)	0.654	0.680	0.736	0.553	0.623	0.749	0.717	0.736	0.725	0.779	0.918			
Managerial Quotient (MQ)	0.589	0.660	0.644	0.501	0.627	0.728	0.684	0.794	0.647	0.793	0.776	0.877		
Managing Self Quotient (MSQ)	0.755	0.780	0.828	0.716	0.762	0.863	0.815	0.869	0.828	0.872	0.880	0.865	0.732	
Project Performance (PP)	0.515	0.942	0.730	0.629	0.581	0.696	0.646	0.572	0.679	0.530	0.648	0.560	0.723	1.000

AVE represents the extent of variance in each construct that is explained by its indicators, and it is used as an indicator of convergent validity. The Fornell and Larcker Criterion proposes that the AVE for each construct should be higher than its squared correlations with other constructs in the model to demonstrate discriminant validity.

Based on the table, all constructs have AVE values greater than their squared correlations along with other constructs, indicating that the constructs have discriminant validity. Additionally, the AVE values for all constructs are greater than 0.5 which indicates good convergent validity.

These results are suggestive of the constructs in the model (i.e., leadership competencies and project manager performance) to be distinct from each other and have good convergent validity, which supports the use of the model for further analysis.

Figure 4.9 presents the model Fornell and Larcker Criterion with all the values of the arrows connecting the latent variables with their measured variables.

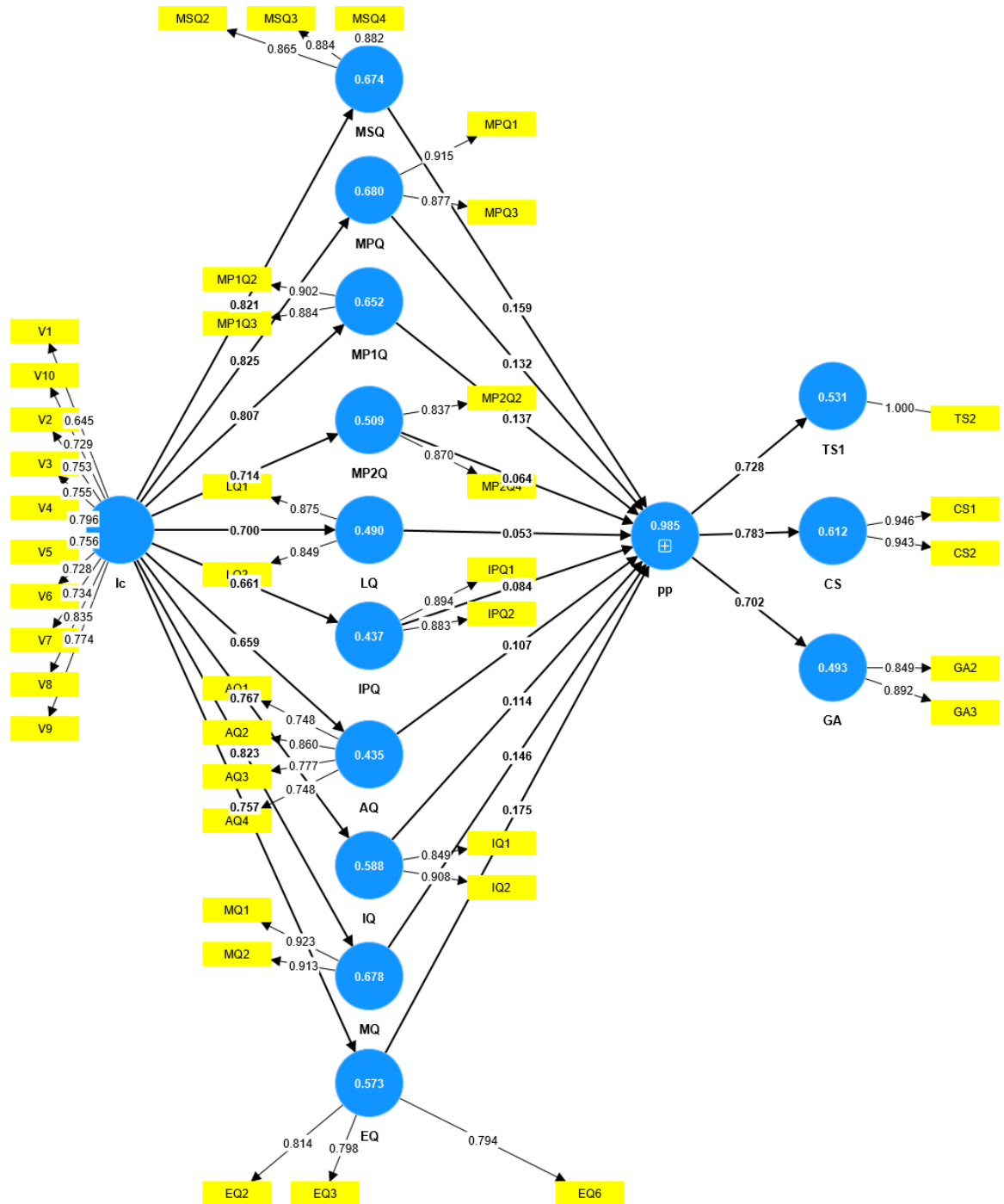


Figure 4. 8: Fornell and Larcker Criterion Values

- Cross Loading**

Cross-loading, which also focuses on the level of the questions themselves (measured variable), assesses how far the measured variables are from each other. This

implies, in a matrix perspective, that the value of a variable with itself must be greater than its value with other variables. Once true, it is considered a valid framework variable. Otherwise, it is impractical to have two phenomena and variables that describe the same attribute. In such a case, it is preferable to use the phenomenon and variable with the highest and best value. Notably, if the value of the comparison satisfies the condition of the highest value with itself and has other values that show a close number to itself, that means they have a high degree of correlation. It is most likely that researchers have already studied and addressed how they are related.

Table 4.8 portrays the results of the cross-loading analysis, which is a technique used in partial least squares (PLS) analysis to evaluate the relationship between latent variables and their indicators.

Each row in the table represents an indicator variable, and each column represents a latent variable. The numbers in the cells represent the cross-loading coefficients which indicate the strength of the association amongst the indicator variable and the latent variable. A high cross-loading coefficient shows that the indicator variable is a good measure of the latent variable.

For example, looking at the sixth row, we can see that EQ1 has relatively high cross-loading coefficients with all the latent variables. This suggests that EQ1 is a good measure of most of the latent variables being studied.

Overall, the cross-loading analysis is useful for evaluating the validity of the indicators being used to measure the latent variables and can help researchers refine their measurement model to improve the accuracy of their results.

Table 4. 11: Cross-loading Values

	AQ	CS	EQ	GA	IPQ	IQ	LQ	M	MP1Q	MP2Q	MPQ	MQ	MSQ	PP	TS
AQ1	0.749	0.465	0.55	0.442	0.523	0.555	0.517	0.551	0.488	0.526	0.498	0.477	0.469	0.588	0.465
AQ2	0.859	0.496	0.545	0.426	0.583	0.546	0.519	0.512	0.54	0.554	0.551	0.461	0.508	0.611	0.496
AQ3	0.774	0.31	0.485	0.378	0.32	0.455	0.332	0.417	0.384	0.269	0.487	0.379	0.414	0.47	0.31
AQ4	0.75	0.402	0.61	0.471	0.514	0.692	0.605	0.563	0.569	0.632	0.56	0.547	0.612	0.661	0.402
CS1	0.507	0.946	0.723	0.656	0.745	0.647	0.686	0.664	0.676	0.678	0.662	0.636	0.682	0.75	0.946
EQ1	0.582	0.516	0.798	0.592	0.696	0.597	0.655	0.682	0.699	0.647	0.736	0.652	0.666	0.76	0.516
EQ2	0.455	0.558	0.752	0.861	0.47	0.385	0.489	0.558	0.539	0.536	0.562	0.432	0.541	0.606	0.558
EQ3	0.405	0.544	0.69	0.819	0.486	0.404	0.483	0.544	0.464	0.505	0.443	0.418	0.431	0.554	0.544
EQ4	0.529	0.621	0.801	0.851	0.649	0.583	0.583	0.593	0.629	0.588	0.582	0.544	0.558	0.682	0.621
EQ5	0.66	0.681	0.845	0.633	0.654	0.728	0.605	0.761	0.732	0.761	0.743	0.682	0.739	0.814	0.681
EQ6	0.61	0.688	0.771	0.504	0.653	0.723	0.734	0.694	0.67	0.68	0.663	0.731	0.67	0.77	0.688
GA1	0.455	0.558	0.752	0.861	0.47	0.385	0.489	0.558	0.539	0.536	0.562	0.432	0.541	0.606	0.558
GA2	0.405	0.544	0.69	0.819	0.486	0.404	0.483	0.544	0.464	0.505	0.443	0.418	0.431	0.554	0.544
GA3	0.529	0.621	0.801	0.851	0.649	0.583	0.583	0.593	0.629	0.588	0.582	0.544	0.558	0.682	0.621
IPQ1	0.57	0.616	0.61	0.448	0.796	0.614	0.622	0.603	0.635	0.629	0.585	0.555	0.566	0.684	0.616
IPQ2	0.514	0.53	0.598	0.596	0.798	0.528	0.678	0.569	0.649	0.581	0.636	0.518	0.546	0.67	0.53
IPQ3	0.489	0.655	0.68	0.544	0.862	0.682	0.759	0.677	0.769	0.704	0.722	0.677	0.67	0.779	0.655
IPQ4	0.558	0.737	0.731	0.567	0.898	0.747	0.818	0.665	0.706	0.763	0.656	0.657	0.662	0.788	0.737
IQ1	0.695	0.567	0.622	0.494	0.641	0.848	0.677	0.565	0.604	0.601	0.566	0.543	0.555	0.678	0.567
IQ2	0.603	0.674	0.693	0.477	0.71	0.909	0.742	0.765	0.773	0.717	0.726	0.709	0.81	0.826	0.674
LQ1	0.563	0.619	0.658	0.563	0.732	0.659	0.846	0.618	0.675	0.699	0.651	0.631	0.619	0.737	0.619
LQ2	0.587	0.646	0.746	0.634	0.794	0.741	0.905	0.721	0.78	0.718	0.711	0.719	0.695	0.818	0.646

Table 4. 12: Cross-loading Values (Continued)

LQ3	0.493	0.565	0.546	0.36	0.667	0.665	0.802	0.589	0.623	0.609	0.513	0.56	0.607	0.666	0.565
MP1Q 1	0.615	0.723	0.764	0.578	0.745	0.712	0.721	0.771	0.887	0.717	0.768	0.703	0.779	0.84	0.723
MP1Q 2	0.561	0.531	0.735	0.644	0.697	0.662	0.683	0.761	0.865	0.629	0.741	0.658	0.749	0.8	0.531
MP1Q 3	0.457	0.56	0.577	0.447	0.649	0.636	0.678	0.677	0.827	0.706	0.729	0.631	0.743	0.75	0.56
MP1Q 4	0.6	0.629	0.741	0.591	0.775	0.747	0.766	0.78	0.908	0.718	0.783	0.702	0.797	0.852	0.629
MP2Q 1	0.539	0.551	0.629	0.462	0.619	0.633	0.579	0.695	0.694	0.826	0.624	0.592	0.653	0.725	0.551
MP2Q 2	0.47	0.572	0.641	0.599	0.611	0.53	0.548	0.573	0.6	0.803	0.582	0.569	0.535	0.66	0.572
MP2Q 3	0.602	0.506	0.694	0.549	0.659	0.571	0.713	0.666	0.621	0.849	0.683	0.617	0.662	0.746	0.506
MP2Q 4	0.519	0.677	0.678	0.517	0.731	0.728	0.751	0.643	0.678	0.796	0.63	0.641	0.66	0.75	0.677
MPQ1	0.582	0.653	0.729	0.527	0.686	0.683	0.649	0.803	0.78	0.691	0.87	0.759	0.833	0.838	0.653
MPQ2	0.597	0.566	0.753	0.592	0.748	0.677	0.723	0.785	0.844	0.72	0.916	0.732	0.817	0.857	0.566
MPQ3	0.578	0.456	0.65	0.558	0.602	0.569	0.54	0.667	0.632	0.581	0.836	0.713	0.635	0.718	0.456
MPQ4	0.568	0.556	0.662	0.505	0.631	0.626	0.626	0.739	0.718	0.659	0.828	0.692	0.738	0.772	0.556
MQ1	0.609	0.633	0.684	0.497	0.652	0.686	0.659	0.799	0.733	0.732	0.778	0.852	0.785	0.82	0.633
MQ2	0.591	0.616	0.712	0.535	0.646	0.69	0.726	0.71	0.711	0.674	0.734	0.901	0.722	0.795	0.616
MQ3	0.507	0.562	0.666	0.491	0.624	0.658	0.627	0.692	0.689	0.601	0.75	0.911	0.675	0.755	0.562
MQ4	0.251	0.255	0.446	0.314	0.493	0.316	0.501	0.457	0.414	0.44	0.536	0.693	0.462	0.513	0.255
MSQ1	0.591	0.622	0.716	0.554	0.624	0.71	0.678	0.774	0.736	0.724	0.755	0.684	0.859	0.814	0.622

Table 4. 13: Cross-loading Values (Continued)

MSQ2	0.556	0.646	0.631	0.508	0.58	0.691	0.608	0.767	0.73	0.621	0.721	0.697	0.839	0.775	0.646
MSQ3	0.431	0.526	0.576	0.404	0.634	0.607	0.615	0.647	0.759	0.638	0.686	0.611	0.843	0.732	0.526
MSQ4	0.555	0.56	0.62	0.478	0.616	0.617	0.646	0.737	0.723	0.602	0.745	0.699	0.826	0.768	0.56
MSQ5	0.452	0.494	0.557	0.433	0.514	0.577	0.501	0.664	0.638	0.531	0.68	0.609	0.769	0.68	0.494
MSQ6	0.582	0.596	0.725	0.593	0.659	0.723	0.654	0.809	0.788	0.697	0.79	0.71	0.863	0.832	0.596
MSQ7	0.607	0.595	0.744	0.566	0.642	0.688	0.69	0.777	0.765	0.677	0.768	0.666	0.851	0.816	0.595
TS1	0.507	0.946	0.723	0.656	0.745	0.647	0.686	0.664	0.676	0.678	0.662	0.636	0.682	0.75	0.946
TS2	0.515	0.942	0.744	0.634	0.689	0.696	0.668	0.678	0.649	0.651	0.564	0.565	0.624	0.722	0.942
V1	0.499	0.418	0.623	0.599	0.537	0.511	0.489	0.642	0.553	0.499	0.552	0.511	0.525	0.618	0.418
V10	0.49	0.58	0.671	0.487	0.625	0.644	0.622	0.731	0.706	0.614	0.708	0.695	0.746	0.751	0.58
V2	0.477	0.477	0.574	0.468	0.57	0.501	0.562	0.751	0.717	0.58	0.628	0.552	0.649	0.689	0.477
V3	0.422	0.452	0.57	0.524	0.488	0.516	0.512	0.753	0.639	0.543	0.648	0.53	0.632	0.663	0.452
V4	0.448	0.596	0.543	0.433	0.465	0.607	0.497	0.793	0.617	0.539	0.628	0.647	0.64	0.677	0.596
V5	0.542	0.587	0.64	0.462	0.599	0.607	0.653	0.758	0.618	0.677	0.639	0.589	0.671	0.724	0.587
V6	0.455	0.47	0.592	0.52	0.549	0.506	0.57	0.73	0.565	0.546	0.583	0.582	0.489	0.642	0.47
V7	0.561	0.581	0.676	0.495	0.627	0.564	0.548	0.735	0.642	0.666	0.693	0.656	0.678	0.733	0.581
V8	0.541	0.555	0.691	0.545	0.573	0.658	0.591	0.835	0.702	0.597	0.713	0.634	0.786	0.771	0.555
V9	0.511	0.59	0.635	0.521	0.587	0.623	0.623	0.774	0.667	0.642	0.718	0.628	0.793	0.755	0.59

4.3.2 Assessment Structural Model

The outcome of the analysis is the effect of leadership competencies on the project performance. Project performance is called “Endogenous Variable”. While all the other leadership competencies (latent variables) are called “Exogenous Variable”. Hair et al. (2011) studied researches which used structural equation modeling and came up with a program that does the calculation automatically by computer software. Hair et al. (2011) described five tests to assess the structural model as explained in in sub-sections 4.4.2.1 ~4.4.2.5.

A. Coefficient of Determination (R^2)

Using linear regression statistics, the “coefficient of determination (R^2)” indicates the percentage by which exogenous factors explain the ultimate endogenous variables. To demonstrate, this value indicates the predictive and explanatory power of the model. 0 to 1 is the range of the coefficient of determination. However, the determination of what proportion is acceptable is entirely contextual. In physical science, the highest degree approaches 1, for instance. In contrast, the high degree in social science is close to 0.3. For our model, LC is a subclass of social science and any figure above 0.25 is deemed acceptable for the model's result prediction. According to Hair et al. (2011), however, values of 0.25, 0.5 and 0.75 are considered weak, moderate, and high, respectively.

R^2 formula is shown below:

$$R^2 = 1 - \frac{RSS}{TSS}$$

Where,

R²: Determination coefficient

RSS: Residuals sum of squares

TSS: Squares total sum

Table 4.9 & Figure 4.9 represent the R-square and R-square adjusted coefficients of determination for the variables in the study, including leadership competencies and project performance. The R-square coefficient of determination measures the proportion of variance in the dependent variable (project performance) that can be explained by the independent variables (leadership competencies), while the R-square adjusted coefficient measures the number of independent variables in the model and adjusts for any potential overfitting.

Looking at the table, we can see that the R-square and R-square adjusted values range from 0.436 to 0.995 and from 0.428 to 0.994, respectively. These values indicate that the independent variables (leadership competencies) have a moderate to high explanatory power on the dependent variable (project performance). In other words, these leadership competencies are significant predictors of project manager performance.

The variables with the highest R-square and R-square adjusted values are MSQ, MPQ, and Project Performance, with values of 0.788/0.784, 0.757/0.754, and 0.995/0.994, respectively. This suggests that these variables have the strongest impact on project manager performance, and thus are the most significant leadership competencies for project managers.

On the other hand, the variables with the lowest R-square and R-square adjusted values are AQ and GA, with values of 0.436/0.428 and 0.536/0.529, respectively. This indicates that these variables have the weakest impact on project manager performance, and thus are the least important leadership competencies for project managers.

Overall, the R-square and R-square adjusted coefficients of determination in the table provide valuable information about the relation among the leadership competencies and project manager performance. The results suggest that certain leadership competencies are more important than others in predicting project manager performance, which can help in training and development programs for project managers.

Table 4. 14: R-square and R-square adjusted coefficients

	R-square	R-square adjusted
Administrative Quotient (AQ)	0.436	0.428
Client/End-User Satisfaction (CS)	0.608	0.602
Emotional Quotient (EQ)	0.689	0.684
Overall Goal Attainment (G)	0.536	0.529
Interpersonal Quotient (IPQ)	0.564	0.557
Intelligence Quotient (IQ)	0.589	0.583
Leading Organizations (LQ)	0.574	0.567
Leadership Competencies (LC)	0.737	0.733
Managing People (MP1Q)	0.623	0.617
Managing Programs (MP2Q)	0.757	0.754
Managing Projects Quotient (MPQ)	0.648	0.643
Managerial Quotient (MQ)	0.788	0.784
Managing Self Quotient (MSQ)	0.995	0.994
Project Performance (PP)	0.608	0.602

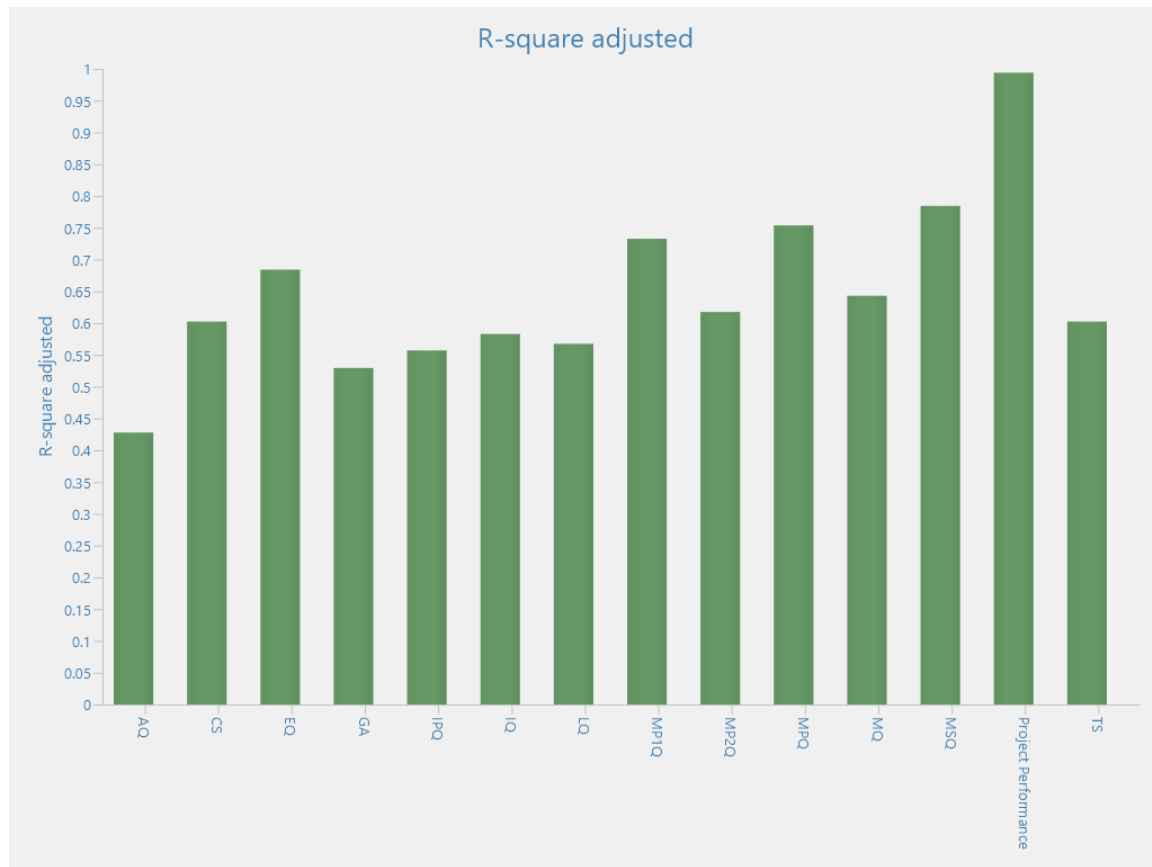


Figure 4. 9: R-square adjusted coefficients

B. Effect Size (F^2)

The effect size (F^2) indicates the proportion by which each exogenous variable may explain the endogenous variable. Furthermore, F^2 provides the exact proportion of each exogenous variable's impact. The effect size is a measure of the strength among two variables in the statistical population as shown by the below formula:

$$F^2 = \frac{F^2_{AB} - R^2_A}{1 - R^2_{AB}}$$

Where

R^2_A : Variance attributable to a collection of one or more independent factors A

R^2_{AB} : Total variance explained by A and B, where B is a second collection of one or more independent variables.

The effect size values considered satisfactory and the exogenous variable worth being in the framework are varied between three numbers 0.02, 0.15 and 0.35, representing small, medium and large effects respectively (Cohn, 1988).

Table 4.10 and Figure 4.10 show the Effect Size (F^2) values for each predictor variable and the criterion variable. The Effect Size (F^2) values range from 0 to 3.709, with higher values indicating a stronger effect.

Looking at the table, we can see that the highest effect size is for MSQ (Managing Self Quotient) with a value of 1.368, followed by EQ (emotional Quotient) with a value of 1.318, Managerial Quotient (MQ) with a value of 0.466, Managing Programs (MP2Q) with a value of 0.466, and Managing People (MP1Q) with a value of 0.406. This suggests that the mentioned quotients have a strong positive effect on project manager performance.

Table 4. 15: Effect Size (F^2) values for each construct against the project performance

Construct	f-square	Decision
Managing Self Quotient (MSQ)	1.368	Large
Managing Projects Quotient (MPQ)	0.349	Medium
Managing People (MP1Q)	0.406	Large
Managing Programs (MP2Q)	0.466	Large
Leading Organizations (LQ)	0.167	Medium
Interpersonal Quotient (IPQ)	0.268	Medium
Administrative Quotient (AQ)	0.321	Medium
Intelligence Quotient (IQ)	0.12	Medium
Managerial Quotient (MQ)	0.466	Large
Emotional Quotient (EQ)	1.318	Large

Other factors that appear to moderately affect project manager performance include Managing Projects Quotient (MPQ), Leading Organizations (LQ), Interpersonal Quotient (IPQ), Administrative Quotient (AQ), Intelligence Quotient (IQ)

Overall, these findings suggest that managing self, emotional intelligence, managerial quotient, managing programs and managing people, are key factors that can enhance project manager performance which in turn can improve customer and team satisfaction.

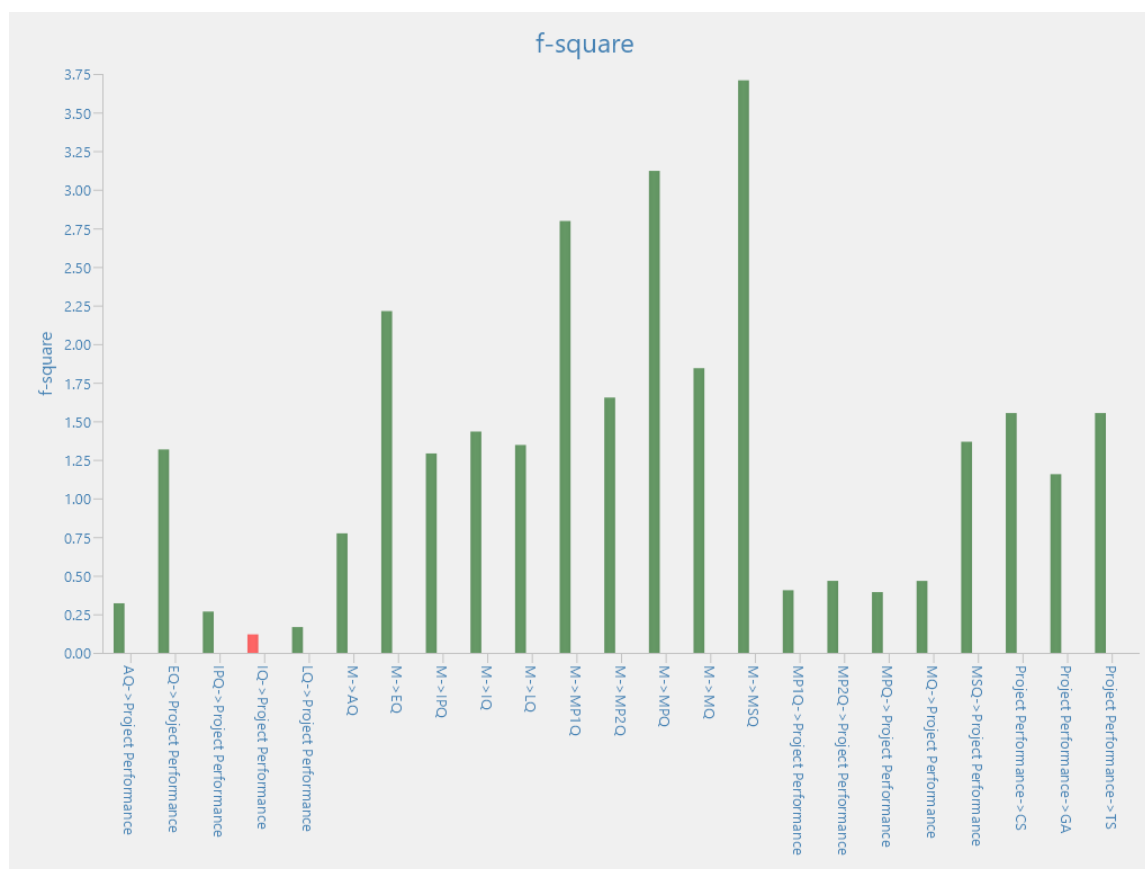


Figure 4. 10: Effect Size (F2) values for each predictor variable and the criterion variable

C. Blindfolding and Prediction of Relevance (Q^2)

The relevance power of variables in the model, also known as Stone- Q^2 value, must be measured and predicted (Geisser, 1974). Smart PLS measures this value using a cross-validated redundancy technique. This method excludes a number measured from the questionnaire and attempts to anticipate it, then calculates the difference between the actual deleted value and the expected one. The software removes each variable one at a time, calculating the difference between the variable's actual presence and its projected existence in the model. This will demonstrate the model's strength by assessing each variable's true significance to the endogenous variable. If the model's prediction relevance factor is more than zero, it is called strong. A zero or negative number indicated a model with no importance in measuring its result.

Table 4.11 represents the Blindfolding and Prediction of Relevance (Q^2) results for the analysis of the effect of leadership competencies on project performance, using Partial Least Squares (PLS) software. The Q^2 coefficient is a measure of the predictive relevance of the model, which indicates how well the model predicts the dependent variable (project performance) based on the independent variables (leadership competencies).

The table shows the values of the sum of squares due to regression (SSO) and the sum of squares due to error (SSE) for each of the independent variables (leadership competencies) and the dependent variable (project performance). The Q^2 value is also reported for each variable, which is calculated as $(1 - SSE/SSO)$.

Based on the Q^2 values, the model has moderate to high predictive relevance, as most of the independent variables have Q^2 values greater than 0.4. The highest Q^2 values are

observed for MP1Q (0.55), MPQ (0.55), and MSQ (0.54), which suggests that these leadership competencies have a strong predictive power for project performance. The lowest Q² value is observed for AQ (0.23), which suggests that this leadership competency has a weak predictive power for project performance.

Overall, the results suggest that the analyzed leadership competencies have a significant effect on project performance, and the PLS model can predict project performance with moderate to high accuracy based on these competencies.

Table 4. 16: Blindfolding and Prediction of Relevance (Q²)

Construct	SSO	SSE	Q ² (=1-SSE/SSO)
Administrative Quotient (AQ)	272	210.096	0.228
Client/End-User Satisfaction (CS)	136	62.972	0.537
Emotional Quotient (EQ)	408	243.002	0.404
Overall Goal Attainment (G)	204	127.829	0.373
Interpersonal Quotient (IPQ)	272	165.802	0.39
Intelligence Quotient (IQ)	136	77.83	0.428
Leading Organizations (LQ)	204	121.699	0.403
Leadership Competencies (LC)	680	680	0
Managing People (MP1Q)	272	122.352	0.55
Managing Programs (MP2Q)	272	161.022	0.408
Managing Projects Quotient (MPQ)	272	121.019	0.555
Managerial Quotient (MQ)	272	150.335	0.447
Managing Self Quotient (MSQ)	476	218.663	0.541
Project Performance (PP)	3536	1711.738	0.516
Team Satisfaction (TS)	136	62.972	0.537

D. Goodness of Fit of the model (GOF)

The observed correlation and the indicated correlation in the model are used by GOF to assess how well the proposed model structure fits the actual data. The optimum statistical method to assess GOF has been the topic of debate among researchers. Researchers often utilize one of the following four approaches:

1. “The goodness of Fit Index (Henseler & Sarstedt, 2012)”
2. “Standardized Root Mean Square Residual (SRMR) (Henseler et al., 2015)”
3. “Root Mean Square Residual Covariance (Henseler et al., 2015)”
4. “Exact Fit Test (Dijkstra et al., 2015) ”

The value that is larger than zero is deemed to be a right fit for the model according to what is utilized in PLS software, and what is advised by the developer Hair. Regardless of all debates and the best method to obtain GOF. The number, however, must not be greater than 0.12; otherwise, there is a poor match among the proposed structural model and the associated empirical data. The model's regular root mean square residual value is SRMR=0.099, which indicates a strong fit for the model because it is above zero but below the suggested threshold of 0.12.

E. Hypothesis Testing (Path Coefficient)

The path coefficient is the precise test required to demonstrate the link between all latent variables in the model. Typically, this test involves assessing the “p-value (probability value of extremism or rarer)”. In the report created by Smart PLS, the p-value is represented in a tabular format. After expanding the data and resampling them (from number of collected data to 5000), the p-value calculation is performed using a technique known as "Bootstrapping" in Smart PLS. The purpose of bootstrap is to expand the collected data (the Sample of x participants) to match the original possible population of the whole construction sector in order to compute any possible standard error in the sample collected. After resampling the data, Smart PLS measures the t-value and automatically calculates the p-value based on the empirical data collected and the t-value extraction. After

obtaining the p-value and ensuring that its standard error is less than 5 percent, a recommendation on the relationship is made.

Table 4.12 provides the results of a proposition testing of the path coefficients for the constructs investigating the effect of leadership competencies on project performance. According to the PLS software, the results are presented for each path coefficient as follows:

1. Original sample (O): This column shows the path coefficient for each predictor variable in relation to the dependent variable (project performance) based on the original data.
2. Sample mean (M): This column shows the path coefficient for each predictor variable in relation to the dependent variable (project performance) based on the sample mean.
3. Standard deviation (STDEV): This column shows the standard deviation for each predictor variable.
4. T statistics ($|O/STDEV|$): This column shows the T statistics for each predictor variable, which is the ratio of the path coefficient to the standard deviation. The significance of the path co-efficient is tested using this.
5. P values: This column shows the p-value for each predictor variable. A p-value less than 0.05 shows that the path coefficient is statistically significant.

Based on the results, the following conclusions can be drawn:

1. All predictor variables have a statistically significant positive effect on project performance, as indicated by their path coefficients and p-values.

2. Among the predictor variables, the strongest effects are observed for M->MP1Q, M->MPQ, and MSQ->Project Performance, with path coefficients of 0.858, 0.87, and 0.22, correspondingly.
3. The weakest effects are observed for IQ -> Project Performance and MP2Q -> Project Performance, with path coefficients of 0.052 and 0.1, respectively.
4. The p-values for all predictor variables are less than 0.05, indicating that the impact of these variables on project performance are statistically significant.

In summary, the results of the hypothesis testing indicate that leadership competencies have a positive and statistically significant effect on project performance and that some competencies may have a stronger effect than others. These findings may have important implications for organizations seeking to develop and assess leadership competencies in their project managers.

Table 4. 17: hypothesis testing of the path coefficients.

Hypothesis	Relationship	Standard deviation (STDEV)	T statistics (O/STDEV)	P values	Decision
H1a	AQ -> Project Performance	0.021	3.093	0.002	Accept
H1b	EQ -> Project Performance	0.026	6.652	0	Accept
H1c	IPQ -> Project Performance	0.033	2.64	0.008	Accept
H1d	IQ -> Project Performance	0.023	2.251	0.024	Accept
H1e	LQ -> Project Performance	0.03	2.281	0.023	Accept
H1f	MP1Q -> Project Performance	0.029	4.221	0	Accept
H1g	MP2Q -> Project Performance	0.023	4.376	0	Accept
H1h	MPQ -> Project Performance	0.029	4.308	0	Accept
H1i	MQ -> Project Performance	0.017	5.699	0	Accept
H1j	MSQ -> Project Performance	0.028	7.98	0	Accept
H2a	LC -> AQ	0.088	7.525	0	Accept
H2b	LC -> EQ	0.054	15.321	0	Accept

Table 4. 18: hypothesis testing of the path coefficients.

H2c	LC -> IPQ	0.081	9.302	0	Accept
H2d	LC -> IQ	0.066	11.676	0	Accept
H2e	LC -> LQ	0.071	10.71	0	Accept
H2f	LC -> MP1Q	0.044	19.623	0	Accept
H2g	LC -> MP2Q	0.066	12.01	0	Accept
H2h	LC -> MPQ	0.038	22.782	0	Accept
H2i	LC -> MQ	0.055	14.709	0	Accept
H2j	LC -> MSQ	0.036	24.834	0	Accept

4.3.3 Assessment of Mediation

When a phenomenon or a desired outcome is explained, usually all of the factors that might contribute to that outcome are studied. Many researchers have utilized LC as a variable to explain and obtain a percentage of influence on the improvement of project performance in the construction sector. They began investigating if LC had a direct impact on and explain for project performance. As their research progresses, interest in this field of study grows and more researchers demonstrate the presence of an LC-Project performance correlation. This resulted in the discovery of additional explanatory factors called "Mediators". Mediators are a process that explains the causal relationship on the subject of "How the cause (LC) and the effect (Project performance) relationship are related. The solution is through the mediators of the causal link" (Managing Self Quotient (MSQ), Managing People (MP1Q), Managing Programs (MP2Q), Leading Organizations (LQ), Intelligence Quotient (IQ)", Managerial Quotient (MQ), Emotional Quotient (EQ), Administrative Quotient (AQ), Interpersonal Quotient (IPQ), Managing Projects Quotient (MPQ), Overall Goal Attainment (GA), Team Satisfaction (TS), Client/End-User Satisfaction (CS).

A. Approaches to Testing Mediation

Baron et al. (1986) was the first to investigate the indirect association between variables via the mediation role effect. They offer four techniques to do this: 1) The initial indirect path estimate among the independent variable (LC) and the dependent variable (Work Attitudes) should be substantially different from zero; 2) The estimated second indirect path among the independent variable (Work Attitudes) and the dependent variable (Project Performance) must be significantly different from zero; 3) The impact of the direct link between (LC) must be reduced with the presence of a mediator; 4) With the mediator included, the estimate of the direct path must be non-significant. Without the mediator, the estimate of the direct path must be significant. The "Sobel Test" is performed after all prior processes have been checked and satisfied. Using a statistical method known as the t-test, this test is performed to know if there is a significant decrease in the direct association when the mediator exists.

Preacher & Hayes (2008) proposed what is known as "The mediation Package" among scholars; this technique use the bootstrap method to determine the power limitation of the Sobel test. It employs a random sample size segmentation with a suggestion of "5000 sample size," allowing for the acquisition of data from tiny sample size results. For decades, scholars have used this strategy extensively. This study will follow the research leads from the previous decades and will utilize the "The mediation Package", which identifies two processes to evaluate the mediation, known as Bootstrap the bootstrap confidence and the interval indirect impact.

4.3.4 Bootstrap the indirect effect

This value will be calculated using PLS software that measures the indirect “P-Value” which reflects the relationship between LC and Project performance.

Table 3.13 presents the bootstrap indirect effect of various leadership competencies (independent variables) on project manager performance (dependent variable) through the mediating variables of Team Satisfaction (TS), Goal Attainment (GA), and Customer Satisfaction (CS).

The results indicate that all the independent variables have a significant indirect influence on project manager performance. The indirect effect is positive for all the variables except for the intelligence quotient (IQ) competency, which has a little positive indirect influence on project manager performance through CS and GA.

The mediating variables also have significant indirect impacts on project manager performance. TS has the most significant indirect effect on project performance among the mediating variables.

In conclusion, the results suggest that leadership competencies play an important role in enhancing project performance. The results highlight the value of developing competencies related to managerial skills, communication skills, emotional intelligence, and other leadership skills to improve project manager performance.

Table 4. 19: Bootstrap Indirect Effect of Various Leadership Competencies

Relationship	P values
AQ -> CS	0.001
AQ -> GA	0.001
AQ -> TS	0.001
EQ -> CS	0
EQ -> GA	0
EQ -> TS	0
IPQ -> CS	0.007
IPQ -> GA	0.008
IPQ -> TS	0.007
IQ -> CS	0.022
IQ -> GA	0.027
IQ -> TS	0.022
LQ -> CS	0.026
LQ -> GA	0.022
LQ -> TS	0.026
LC -> CS	0
LC -> GA	0
LC -> Project Performance	0
LC -> TS	0
MP1Q -> CS	0
MP1Q -> GA	0
MP1Q -> TS	0
MP2Q -> CS	0
MP2Q -> GA	0
MP2Q -> TS	0
MPQ -> CS	0
MPQ -> GA	0
MPQ -> TS	0
MQ -> CS	0
MQ -> GA	0
MQ -> TS	0
MSQ -> CS	0
MSQ -> GA	0
MSQ -> TS	0

B. Bootstrap Confidence Interval

The confidence interval has a value between -1 and +1. It might be larger or smaller, that would occur in rare occasions (Hair et al., 2011). To have a latent variable that acts as a mediator, the distribution's upper limit (UL) and lower limit (LL) should be in the same direction of either positivity or negative. If one of the limits is positive and the other is negative, which means it encompasses the zero between the two limits, the model considers it irrelevant and has no mediation to the LC-Project performance correlation.

Table 3.14 represents the Bootstrap Confidence Intervals for the coefficients in a partial least squares (PLS) regression analysis of the impact of leadership competencies on project manager performance. The Bootstrap Confidence Intervals provide a range of plausible values for each coefficient based on resampling the original data.

Each row in the table represents a different path in the PLS model, indicating the impact of one variable (the independent variable) on another variable (the dependent variable). The columns provide the following information:

1. Original sample (O): the coefficient estimates from the original sample.
2. Sample mean (M): the mean of the coefficients estimated from the resampled data sets
3. Bias: the difference between the sample mean and the original sample estimate, indicating the presence of bias in the estimate
2.50%: the lower limit of the 95% Bootstrap Confidence Interval
97.50%: the upper limit of the 95% Bootstrap Confidence Interval

In interpreting the table, we can focus on the Bootstrap Confidence Interval column, which indicates the range of values within which it can be confidently said that the true coefficient lies. If the confidence interval does not include zero, it can be concluded that the impact of the independent variable on the dependent variable is statistically significant at the 95% confidence level.

For example, looking at the first row, the effect of AQ (Administrative Quteut) on CS (Customer Satisfaction) has a coefficient estimate of 0.05 in the original sample, and the 95% Bootstrap Confidence Interval ranges from 0.021 to 0.084. Since the confidence interval does not include zero, it can be concluded that the impact of AQ on CS is statistically significant.

Likewise, the Bootstrap Confidence Intervals for all the other paths in the model can be interpreted. It is important to note that some of the confidence intervals include zero, indicating that the impact of the independent variable on the dependent variable is not statistically significant. The Bias column indicates the presence of bias in some of the coefficient estimates, which can be due to the smaller sample size or other issues with the data.

Table 4. 20: Bootstrap Confidence Intervals

Relationship	Original sample (O)	Sample mean (M)	Bias	2.50%	97.50%
AQ -> CS	0.05	0.051	0	0.021	0.084
AQ -> GA	0.047	0.048	0	0.02	0.079
AQ -> TS	0.05	0.051	0	0.021	0.084
EQ -> CS	0.136	0.138	0.002	0.093	0.173
EQ -> GA	0.128	0.13	0.002	0.086	0.167
EQ -> TS	0.136	0.138	0.002	0.093	0.173
IPQ -> CS	0.067	0.068	0.001	0.021	0.116
IPQ -> GA	0.063	0.064	0.001	0.019	0.11
IPQ -> TS	0.067	0.068	0.001	0.021	0.116
IQ -> CS	0.041	0.041	0	0.011	0.082
IQ -> GA	0.038	0.039	0	0.01	0.078
IQ -> TS	0.041	0.041	0	0.011	0.082
LQ -> CS	0.054	0.054	0	0.016	0.113
LQ -> GA	0.051	0.05	-0.001	0.016	0.103
LQ -> TS	0.054	0.054	0	0.016	0.113
MP1Q -> CS	0.096	0.099	0.003	0.054	0.143
MP1Q -> GA	0.09	0.094	0.003	0.049	0.138
MP1Q -> TS	0.096	0.099	0.003	0.054	0.143
MP2Q -> CS	0.078	0.075	-0.003	0.047	0.123
MP2Q -> GA	0.073	0.071	-0.002	0.044	0.118
MP2Q -> TS	0.078	0.075	-0.003	0.047	0.123
MPQ -> CS	0.096	0.093	-0.003	0.058	0.159
MPQ -> GA	0.09	0.088	-0.002	0.055	0.145
MPQ -> TS	0.096	0.093	-0.003	0.058	0.159
MQ -> CS	0.077	0.077	0	0.049	0.104
MQ -> GA	0.072	0.073	0	0.045	0.1
MQ -> TS	0.077	0.077	0	0.049	0.104
MSQ -> CS	0.172	0.171	-0.001	0.124	0.221
MSQ -> GA	0.161	0.161	0	0.116	0.208
MSQ -> TS	0.172	0.171	-0.001	0.124	0.221
LC -> CS	0.711	0.715	0.004	0.547	0.815
LC -> GA	0.668	0.673	0.006	0.505	0.775
LC -> Project Performance	0.911	0.915	0.004	0.812	0.957
LC -> TS	0.711	0.715	0.004	0.547	0.815

Leadership Competencies Final Model

In the current study, aim is to investigate the impact of leadership competencies on project performance within the construction industry. To achieve this, first a comprehensive leadership competency model was developed accordingly to measure the effect of LC on the project performance. Following the development of this model, a questionnaire was constructed to gather data from industry professionals which allowed to assess the relevance and applicability of the proposed competencies. Subsequently, Partial Least Squares (PLS) software was utilized to validate the model and analyze the results. Remarkably, the findings demonstrated that all constructs within the model meet the established criteria, indicating a strong and robust relationship between leadership competencies and project performance. This outcome suggests that the developed leadership competency model is well-suited for the construction industry, and no adjustments are necessary to enhance its effectiveness in predicting project success

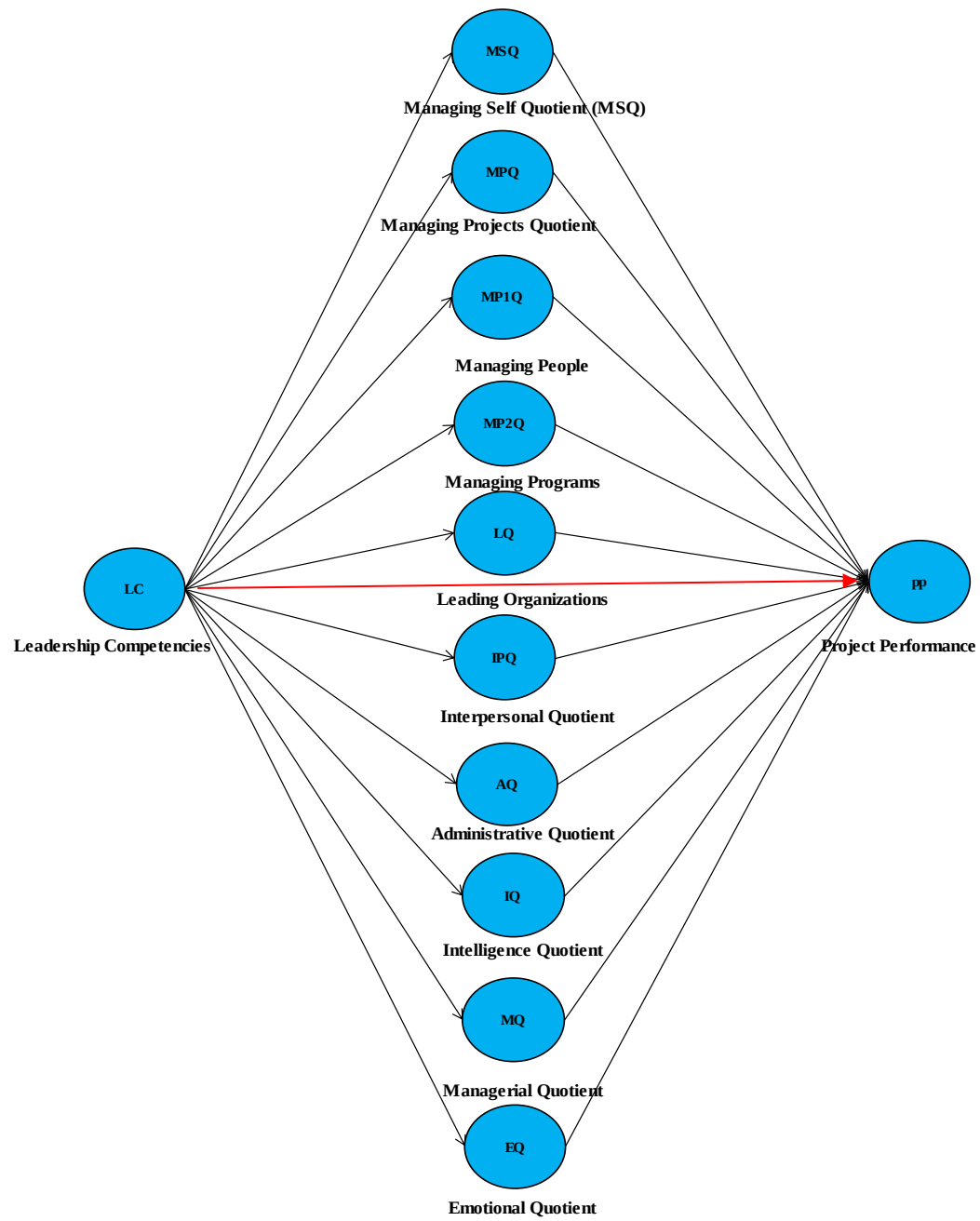


Figure 4. 11: LC Final model

CHAPTER 5 Summary of the Study, Conclusion and

Recommendations

5.1 Overview

This chapter presents a summary of the study, which aims to explore the impact of leadership competencies on project performance within the construction industry. The primary goal of this research is to pinpoint the crucial leadership competencies that contribute to successful project outcomes and to comprehend their influence on project performance. To accomplish this goal, a quantitative research method is utilized, incorporating data from a survey of construction industry professionals.

Section 5.2.1 presents the findings of this study while directly addressing the research questions. These findings offer insights into the specific leadership competencies that significantly affect project performance in the construction industry. Additionally, section 5.2.2 will report on minor findings that emerged during the research process. Although these findings may not directly answer the research questions, they provide valuable insights and contribute to a more comprehensive understanding of the topic.

Section 5.3 draws a conclusion regarding the impact of leadership competencies on project performance in the construction industry. This section provides key insights obtained from the research and emphasizes their implications for both theory and practice.

In section 5.4.1 recommendations for various stakeholders in the construction industry, such as project managers, team members, and organizational leaders, are provided. These

recommendations are based on the study's findings and offer practical guidance on enhancing project performance through effective leadership.

Lastly, section 5.4.2 concludes with recommendations for future research in the area of leadership competencies and project performance in the construction industry. These recommendations identify potential avenues for further investigation and suggest ways in which future studies can build upon the findings of this research.

5.2 Summary of The Study

This study aims to investigate the relationship between leadership competencies and project performance in the construction industry. The research problem is the lack of understanding of the essential skills needed to succeed in creating comprehensive leadership competency models that reflect the relationship between leadership competencies and project performance. The research objectives are to construct and validate a leadership competency model for project managers and to identify the relation between leadership competencies and project performance. The significance of the study lies in raising awareness about the importance of leadership skills in project success and adding to the knowledge base in the area of leadership competencies, which can assist company owners in making key choices about the skills they need to learn to guide their firms in the right direction.

The research begins with an extensive literature review to identify gaps in knowledge related to LC competencies in the project performance within the construction field. A

comprehensive LC model is developed, and data is collected from grade 1 and grade 2 contractors from the Eastern Province of Saudi Arabia through a questionnaire. Partial Least Squares (PLS) analysis is employed to validate the LC model and analyze the results, leading to the establishment of a final model.

5.3 Findings

Based on the results of the study, the following are the major findings that directly answer the research questions.

1. The leadership competency dimensions are Managing Self Quotient (MSQ), Managing Projects Quotient (MPQ), Managing People (MP1Q), Managing Programs (MP2Q), Leading Organizations (LQ), Interpersonal Quotient (IPQ), Administrative Quotient (AQ), Intelligence Quotient (IQ), Managerial Quotient (MQ), and Emotional Quotient (EQ).
2. Managing Self Quotient (MSQ) and Emotional Quotient (EQ) have the highest effect size values, indicating a strong positive impact on project manager performance.
3. Other competencies such as Managerial Quotient (MQ), Managing Programs (MP2Q), and Managing People (MP1Q) also have a strong positive impact on project manager performance.
4. Managing Projects Quotient (MPQ), Leading Organizations (LQ), Interpersonal Quotient (IPQ), Administrative Quotient (AQ), and Intelligence Quotient (IQ) have a moderate effect on project manager performance.
5. All predictor variables have a statistically significant positive effect on project performance.

6. Among the predictor variables, the strongest effects are observed for Managing People Quotient (MP1Q), Managing Projects Quotient (MPQ), and Managing Self Quotient (MSQ), and the weakest effects are observed for Intelligence Quotient (IQ) and Managing Programs Quotient (MP2Q).
7. Customer satisfaction and task satisfaction have the highest amount of variance explained by their respective indicators, suggesting that improving these aspects may lead to better project performance.
8. Some predictor variables have a stronger effect on project performance than others, with Leadership competencies > Managing People Leadership competencies > Managing Projects and Managing Self > Project Performance having the strongest effects, and Intelligence leadership competencies -> Project Performance and Managing Programs -> Project Performance having the weakest effects.
9. Prioritizing the most effective competencies can help organizations optimize their resources and efforts to achieve better project outcomes in the construction industry.

5.4 Conclusion

The leadership competencies of construction project managers have a direct impact on project performance, either directly or through defined moderators. These moderators include emotional intelligence, customer focus, team management, self-management, managerial expertise, program management and people management.

To measure leadership competency, various variables are considered such as problem-solving, technical credibility, human capital management, financial

management, external awareness, experience, administrative expertise, critical analysis and judgment, resource management, and self-awareness.

The managing-self competency is measured using interpersonal skills, continual learning, and resilience. Managing projects competency is measured through team building and decisiveness while managing people competency is measured through leveraging diversity and public service motivation. Managing programs competency is measured through financial management and political savvy.

The leading organizations competency is measured through vision and entrepreneurship, while interpersonal competency is measured through being a broker and mentor. The administrative competency is measured through coordination, direction, facilitation, production, and strategic thinking. Lastly, intelligence competency is measured through vision and imagination, and strategic perspective, while managerial competency is measured through engaging communication and development. Emotional competency is measured through intuitiveness, interpersonal sensitivity, and conscientiousness.

The study also finds that constructs such as customer satisfaction and task satisfaction have the highest amount of variance explained by their respective indicators.

The study's results provide valuable insights into the essential skills needed for successful project outcomes, which can assist construction industry professionals in developing comprehensive leadership competency models. Moreover, the study's findings emphasize the importance of leadership skills in project success and add to the knowledge base in the area of leadership competencies.

5.5 Recommendations

5.5.1 Recommendations

Based on these conclusions, the following recommendations are made for contractors in the construction industry:

1. Contractors are advised to recruit/assign project managers who meet the leadership competency dimensions that are proven to have a direct effect on project outcomes and performance (Mediators shown in the developed LC framework).
2. Contractors are advised to use the study and developed framework to measure the leadership competency skills of their perspective project managers and determine the missing leadership dimensions.
3. Contractors are advised to avail training programs to their potential project managers to enhance their skills in the mission leadership dimensions by referring to the developed framework to improve their ability to work collaboratively and effectively.
4. Contractors are advised to focus on the development of the proven competencies that have been tested and validated due to its correlation and effect on project performance and outcomes.

5.5.2 Recommendations to Future Studies

For future researchers, it is recommended that studies may focus on identifying other critical leadership competencies and their effect on project performance in the construction industry. Additionally, it is suggested that studies explore the effect of leadership competencies on other areas of the construction industry, such as safety and sustainability. By addressing these research gaps, future studies can build upon the findings of this

research and provide further insights into the association between leadership competencies and project performance in the construction industry.

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Appendix A

<i>Gender</i>			
Male	☐	Female	☐
<i>Age (years)</i>			
20 to less than 30	☐	30 to less than 40	☐
40 to less than 50	☐	50 Years or greater	☐
<i>Educational Level</i>			
High School or Diploma	☐	BSc	☐
Master or High Diploma	☐	PhD	☐
Other, Please Specify			
<i>Job title</i>			
Project Engineer	☐	Project Director	☐
Project Manager	☐	General Manger	☐
Other, Please Specify			
<i>Department</i>			
Administrative / Customer Care	☐	Financial	☐
Technical	☐	Engineering	☐
Other, Please Specify			
<i>Experience in Construction Industry</i>			
Less than 5 Years	☐	From 5 – Less than 10 Years	☐
From 10 – Less than 15 Years	☐	15 Years or greater	☐
<i>Company Field</i>			
Oil and Gas	☐	High rise buildings	☐
Infrastructural	☐	Steel structures	☐
Other, Please Specify			
<i>Average Project Size (Contract Value in Saudi Riyals)</i>			

Less than 50 million	☐	50 million to less than 100 million	☐
100 million to less than 150 million	☐	150 million to less than 200 million	☐
200 million or greater	☐		
Average Project Duration (Years)			
Less than 3	☐	3 to less than 5	☐
5 to less than 7	☐	7 to less than 10	☐
10 or greater	☐		

The followings are competency variables. You are kindly requested to measure the quality of your average Project Manager by placing a tic (✓) in the appropriate box next to each quality.							
Competencies for effective project manager		Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
Measuring Leadership Competencies							
1	Problem Solving: The Project Manager identifies and analyzes problems						
2	Technical Credibility: The Project Manager understands and appropriately applies principles, procedures, requirements, regulations, and policies related to specialized expertise						
3	Human Capital Management: The Project Manager builds and manages workforce based on organizational goals, budget considerations, and staffing needs.						
4	Financial Management: The Project Manager monitors expenditures and uses cost-benefit thinking to set priorities.						
5	External Awareness: The Project Manager understands and keeps up-to-date on local, national, and international policies and trends						

	that affect the organization and shape stakeholders' views						
6	Experience: The Project Manager knowledge of relevant design codes, legislation and regulation						
7	Administrative expertise: The Project Manager able to write proposals and apply contract law						
8	Critical analysis and judgment: The Project Manager makes sound judgments and decisions based on reasonable assumptions and factual information, aware of the impact of any assumptions made						
9	Resource Management: The Project Manager plans ahead, organizes all resources and coordinates them efficiently and effectively						
10	Self-Awareness: The Project Manager awareness of one's own feelings and the capability to recognize and manage these in a way that one feels that one can control						
Mediators							
<i>Managing Self competency</i>							
1	Integrity/Honesty: The Project Manager shows consistency in words and actions.						
2	Interpersonal Skills: The Project Manager treats others with respect.						
3	Continual Learning: The Project Manager Assesses and recognizes own strengths and weaknesses.						
4	Resilience: The Project Manager deals effectively with pressure under adversity.						
5	Oral Communication: The Project Manager makes clear and convincing oral presentations.						
6	Written Communication: The Project Manager writes in a clear, concise, organized, and convincing manner for the intended audience.						
7	Flexibility: The Project Manager rapidly adapts to new information, changing conditions, or unexpected obstacles						
<i>Managing Projects competency</i>							

9	Team Building: The Project Manager inspires and fosters team commitment, spirit, pride, and trust.						
11	Accountability: The Project Manager holds self and others accountable for measurable high-quality, timely, and cost-effective results.						
12	Decisiveness: The Project Manager makes well-informed, effective, and timely decisions, even when data are limited, or solutions produce unpleasant consequences;						
13	Influencing / Negotiating: The Project Manager gains cooperation from others to obtain information and accomplish goals						
Managing People competency							
15	Leveraging Diversity: The Project Manager fosters an inclusive workplace where diversity and individual differences are valued and leveraged to achieve the vision and mission of the organization.						
16	Conflict Management: The Project Manager manages and resolves conflicts and disagreements in a constructive manner.						
17	Public Service Motivation: The Project manager Aligns organizational objectives and practices with public interests.						
18	Developing Others: The Project Manager develops the ability of others to perform and contribute to the organization by providing ongoing feedback and by providing opportunities to learn through formal and informal methods						
Managing Programs competency							
19	Technology Management: The Project Manager makes effective use of technology to achieve results.						
21	Creativity: The Project Manager designs and implements new or cutting-edge programs/processes.						
22	Partnering: The Project Manager collaborates across boundaries to build strategic relationships and achieve common goals						
23	Political Savvy: The Project Manager identifies the internal and external politics that impact the work of the organization.						

Leading Organizations competency						
25	Vision: The Project Manager takes a long-term view and builds a shared vision with others.					
26	Strategic Thinking: The Project Manager formulates objectives and priorities, and implements plans consistent with the long-term interest of the organization in a global environment, Capitalizes on opportunities and manages risks					
27	Entrepreneurship: The Project Manager positions the organization for future success by identifying new opportunities					
Interpersonal competency						
	Broker: The Project Manager influences decisions made at higher level					
	Mentor: The Project Manager maintains tight logistical control					
	Innovator: The Project Manager comes up with inventive ideas					
	Integrator: The Project Manager integrates practical experience from different departments to create new knowledge					
Administrative competency						
	Coordinator: The Project Manager anticipates workflow problems, avoid crisis					
	Director: The Project Manager makes the unit's role very clear					
	Facilitator: The Project Manager encourage participant decision making in the group					
	Produce: The Project Manager gets the unit to meet expected goals					
Intelligence competency						
29	Vision and imagination: The Project Manager foresees the impact of changes on one's vision that reflects implementation issues and business realities					
30	Strategic perspective: The Project Manager identifies opportunities and threats.					
Managerial competency						
32	Engaging Communication: The Project Manager clearly communicates instructions and vision to staff					

33	Developing: The Project Manager gives staff autonomy, encourages them to take on personally challenging demanding tasks						
34	Achieving: The Project Manager believes others have potential to take on ever more-demanding tasks and roles, encourages them to do so.						
35	Empowering: The Project Manager willing to make decisions involving significant risk to gain an advantage						
Emotional competency							
37	Emotional Resilience: The Project Manager performs consistently in a range of situations under pressure and adapts behavior appropriately						
38	Intuitiveness: The Project Manager arrives at clear decisions and drives their implementation when presented with incomplete or ambiguous information using both rational and “emotional” or intuitive perceptions of key issues and implications						
39	Interpersonal Sensitivity: The Project Manager willingness to keep open one’s thoughts on possible solutions to problems and to actively listen to, and reflect on, the reactions and inputs from others						
40	Influence: The Project Manager persuades others to change views based on an understanding of their position and a recognition of the need to listen to this perspective and provide a rationale for change						
41	Motivation: The Project Manager drives and energy to achieve clear results and make an impact.						
42	Conscientiousness: The Project Manager shows personal commitment to pursuing an ethical solution to a difficult business issue or problem						
Measuring Project Performance							
Overall Goal Attainment Performance							
	Timeliness: All project assignments were followed as per planned schedule.						

	Budgetary Compliance: The overall budget for the project was essentially the same as planned						
	Quality: The project deliverables were highly reliable and required minimal maintenance						
<i>Team Satisfaction Performance</i>							
	Process Contentment: All participants have been given the opportunity to their views on the project's goal or mission.						
	Implementation Satisfaction: The project team was satisfied with the project's deliverables and the project management process						
<i>Client/End-User Satisfaction Performance</i>							
	Outcomes Satisfaction: Project activities are carried out exactly as planned						
	Project Specifications Fulfilment: The project Specifications were fulfilling their goals						

Vitae

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Education:

Master of Science in Construction Engineering and Management

King Fahad university of petroleum and minerals, Saudi Arabia

Bachelor of Science in Civil Engineering

Prince Mohammed bin Fahd University, Saudi Arabia

Professional Experience:

Field Market Materials Engineer

Precision Polymer Engineering

Specialized in manufacturing sealing solutions for various sectors, with a focus on the energy market.

Previous Experience:

Worked in the infrastructure and piping industry, experienced in GRP and FRP piping

Dealt with desalination entities and water transmission and sewage solutions.

Personal Projects:

Master's thesis: "Leadership Competencies and Their Effect on Project Performance in the Eastern Province"