

Establishing a Leadership Framework for Successful Manufacturing Project Management: A Case Study of Borouge Manufacturing Company

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Abstract

This study investigates the impact of various leadership styles on the success of manufacturing project management, with work engagement as a mediating factor. Using BOROUGE, a leading manufacturing company in the UAE, as a case study, an empirical framework was developed and validated through Structural Equation Modeling-Partial Least Squares (SEM-PLS) analysis. The findings reveal that competency leadership, servant leadership, and behavioral leadership significantly contribute to project management success, while situational leadership does not have a direct effect. Among these, behavioral leadership exerts the strongest positive influence, whereas servant leadership has a negative impact, indicating a complex relationship. In terms of indirect effects, both situational and behavioral leadership demonstrate significant mediation through work engagement. Specifically, situational leadership enhances project success solely through work engagement, whereas behavioral leadership exerts both a direct and an additional indirect effect via work engagement. These findings provide deeper insights into leadership dynamics in manufacturing project management and highlight the critical role of work engagement as a mediating mechanism.

Keywords: Behavioral Leadership, Competency Leadership, Situational Leadership, Servant Leadership

1. Introduction

In today's economy, sustained growth relies on continuous investments in both public and private sector projects. According to (Al-Ali, Singh, Al-Nahyan, & Sohal, 2017), these investments account for substantial expenditures, amounting to trillions of dollars annually, particularly in the construction sector. Effective project management plays a crucial role in ensuring successful project execution, requiring comprehensive, result-oriented, and efficient planning. The success of project management is largely determined by adherence to timelines, budget constraints, and the ability to manage resources effectively. A project is deemed successful if it meets its predefined objectives and delivers the expected outcomes (Almatrooshi, Singh, & Farouk, 2016). Within this context, the role of the project manager is critical in defining and steering project execution toward its desired targets. While project features and functionalities are defined by stakeholders, project managers are responsible for ensuring these requirements are met within the designated timelines and budget constraints (Ramazani & Jergeas, 2015). A project manager's effectiveness is often evaluated based on their ability to optimize resources and align project execution with organizational goals and objectives. To achieve project success, managers must cultivate an efficient and highly skilled team by demonstrating clear vision, strong leadership, and the ability to inspire and attract talent. Consequently, leadership support from the project manager is a significant factor in enhancing project success. Empirical studies in project management literature consistently highlight a positive relationship between a project manager's leadership style and project success. For instance, Walker and Ko (2011) examined the impact of authentic leadership on project delivery and found a strong positive correlation between the two. One of the key ways a project manager contributes to project success is through effective leadership strategies.

The concept of inclusive leadership is relatively new in project management literature, and limited studies have explored its effects within organizational settings. In a study investigating the role of inclusive leadership, psychological safety was identified as a mediating factor. The findings indicated that inclusive leadership positively influences improvement efforts in healthcare teams, both directly and indirectly, through psychological safety (Dayan, Heisig, & Matos, 2017). Further, the indirect impact was mediated by psychological safety and leader-member exchange, with Yin providing supportive evidence for these relationships (Taher, Krotov, & Silva, 2015). Project management research acknowledges the necessity of effective leadership in managing both resources and personnel, particularly in complex projects. However, despite extensive studies on project management and leadership, the extent to which leadership influences project success remains underexplored, particularly regarding the most effective leadership styles in project environments. A major challenge in the UAE is the continued failure of projects due to ineffective leadership. Therefore, this study aims to develop a Leadership Framework for Successful Manufacturing Project Management, using BOROUGE Manufacturing Company in the UAE as a case study.

2. Literature Review

2.1 Subsection Headings, Tables and Figures

Projects are inherently unique, independent, and phased, with clearly defined limitations on scope, duration, and costs (Harrison, Birks, Franklin, & Mills, 2017). To maximize success, every project must have a well-defined purpose that aligns with the strategic goals of the organization (Heagney, 2016). The Project Management Institute identifies two fundamental characteristics of a project: temporariness and uniqueness. Temporariness refers to a project's distinct beginning and end, along with a predefined scope and allocated resources. Uniqueness emphasizes that projects bring together teams that may not typically work together, requiring strong leadership and management to ensure collaboration and efficiency. Successful project management involves comprehensive planning, monitoring, coordination, and control of various components. Managers must establish clear objectives, allocate resources effectively, mitigate risks, and ensure that project milestones are met within the given constraints. Unlike line management, which focuses on maintaining ongoing business operations, project management is dynamic and adaptable, requiring managers to navigate uncertainties and complexities while keeping the project aligned with organizational goals. The success of a project hinges on effective management practices, including strategic decision-making, team leadership, and process optimization. By implementing strong management frameworks, organizations can enhance project outcomes, drive innovation, and achieve sustainable growth.

In the context of manufacturing, project management success is crucial for maintaining competitive advantage, ensuring efficiency, and achieving sustainability goals. Several research studies provide factors contributing to successful project management in this sector. According to The Arabian Post (2024), sustainable project management practices significantly impact the success of manufacturing projects. The study utilized a structural model assessment to analyse how sustainable practices influence project planning and outcomes. They found that integrating sustainability into project management enhances the overall success by ensuring long-term viability, reducing environmental impact, and improving stakeholder satisfaction. This underscores the importance of adopting sustainable methodologies to achieve project goals effectively. A study by Chow, Zailani, Rahman, Qiannan, Bhuiyan and Patwary (2021), examined the critical factors influencing project success in Malaysian manufacturing companies. Their research identified several key elements, including effective communication, stakeholder engagement, and robust risk management. The study emphasizes the role of leadership in fostering a collaborative environment, which is essential for navigating challenges and achieving project milestones. The findings highlight the need for manufacturing firms to prioritize these critical factors to enhance project performance. A study by Kuen, Zailani, and Fernando (2009), explored the effect of project management practices on project success in make-to-order manufacturing organizations. The study found that tailored project management techniques, such as customization of processes and close coordination with clients, significantly contribute to project success. The research indicates that adopting flexible and adaptive project management approaches enables manufacturing firms to meet specific customer requirements

and deliver high-quality products on time. This approach not only ensures project success but also strengthens customer relationships and drives business growth. These studies reveals that successful project management in manufacturing hinges on several critical factors, including sustainable practices, effective communication, stakeholder engagement, and adaptive management techniques. By incorporating these elements into their project management strategies, manufacturing firms can achieve higher project success rates, enhance efficiency, and ensure long-term sustainability. These insights serve as a valuable guide for manufacturing companies aiming to optimize their project management processes and drive overall success

2.2 Project Management Leadership in the Manufacturing Sector

Project management leadership in the manufacturing sector plays a crucial role in ensuring project success by influencing various aspects of execution and overall organizational performance. Leadership in this context involves both organizational leadership, which focuses on securing the company's long-term viability through strategic planning, and employee leadership, which emphasizes motivation, engagement, and efficiency in project execution. Effective leadership is essential in managing the complexities of manufacturing projects, which require continuous innovation, operational efficiency, and adaptability to industry advancements. Leaders who can inspire and guide their teams toward achieving these objectives contribute significantly to the overall success of manufacturing projects (Fraz, Waris, Afzal, Jamil, Shah, & Sultana, 2016).

Transformational leadership has been identified as a key factor in enhancing manufacturing project management. Leaders who adopt transformational behaviors inspire employees to exceed their performance expectations, fostering a culture of innovation and continuous improvement. Burawat (2019) highlights the relationships among transformational leadership, sustainable leadership, lean manufacturing, and sustainability performance in the Thai SMEs manufacturing industry, demonstrating that transformational leadership positively influences sustainable leadership practices. This, in turn, enhances lean manufacturing processes and overall sustainability performance, ensuring that organizations can achieve operational efficiency while maintaining long-term growth. Additionally, leadership behaviors play a significant role in shaping the strategic direction of manufacturing firms. Birasnav (2014) examines how transformational leadership impacts the formulation and implementation of manufacturing strategies, emphasizing that leaders who foster a shared vision and encourage innovation enable their organizations to develop competitive strategies aligned with their business objectives. Xenikou (Kenny, & McCoach, 2003) further supports this notion by highlighting how transformational leadership strengthens organizational identification, which in turn fosters an innovative and goal-oriented culture essential for manufacturing success.

Leadership in manufacturing also involves sustainable practices that balance economic, social, and environmental considerations. Sustainable leadership focuses on long-term viability by integrating lean manufacturing principles, reducing waste, and improving resource utilization. Leaders who prioritize sustainability create a culture of continuous improvement, ensuring that manufacturing processes remain efficient and adaptable to changing market demands

(Burawat, 2019). This approach aligns with broader industry trends, where organizations seek to enhance their sustainability performance while maintaining competitive advantages. Furthermore, leaders in the manufacturing sector must be capable of navigating technological advancements and workforce challenges to maintain productivity and efficiency.

The debate on whether leaders are born or made has long been discussed in leadership studies. While some traits, behaviours, and emotional responses are inherent, education and training play a significant role in developing leadership competencies. Effective project managers in manufacturing possess strong leadership abilities, excellent communication and interpersonal skills, problem-solving capabilities, and time management expertise (Xenikou, 2017; Müller & Turner, 2010). These competencies can be cultivated through training and experience, allowing project managers to refine their leadership styles to suit the demands of the manufacturing sector. Historical perspectives on technological and productivity leadership further highlight the critical role of project management leadership in manufacturing. Broadberry (1994) discusses how technological advancements and productivity improvements have shaped the manufacturing landscape since the Industrial Revolution, demonstrating that effective leadership has been instrumental in navigating complex technological changes and ensuring organizational competitiveness.

2.3 Leadership Skills for Effective Workforce and Project Management

The management of the workforce is one of the most laborious tasks in today's dynamic work environment (Sturm, Vera, & Crossan, 2017). This challenge becomes even more demanding for project-oriented organizations, where resources may be abundant, but employment is often temporary and contract-based. To maintain organizational quality, employees must be consistently motivated. Therefore, effective leadership is essential in fostering a high-performance culture and ensuring that employer expectations are met at all levels within the organization. A successful leadership approach depends on the specific needs of the organization. Situational Leadership plays a crucial role in adapting leadership styles based on employees' competence and commitment levels, allowing leaders to provide the appropriate guidance or autonomy when needed. Similarly, Competency Leadership ensures that leaders possess the necessary skills, knowledge, and expertise to manage teams efficiently while fostering continuous learning and development.

Moreover, leadership is a driving force in promoting social justice and inclusivity in the workplace. However, various hindrances can make inclusive leadership challenging (Espinoza & Ukleja, 2016). These obstacles often stem from ineffective managerial approaches and rigid organizational policies. Servant Leadership can help overcome such barriers by prioritizing employees' needs, fostering a sense of belonging, and empowering individuals to reach their full potential. By focusing on the growth and well-being of employees, servant leaders create an environment where innovation thrives, performance improves, and creative minds are retained (Jalil, 2017).

A leader serves as a role model in setting new standards for inclusive behaviour. Behavioural Leadership emphasizes that leaders must exhibit the right actions such as actively listening, valuing diverse perspectives, and making unbiased decisions to cultivate a culture of

engagement and fairness (Javed, Naqvi, Khan, Arjoon, & Tayyeb, 2017). Leaders who appreciate and recognize employees' contributions foster a workplace where individuals feel valued and encouraged to participate in decision-making processes (Noel, Murphy, & Jariwala, 2016).

Through these leadership approaches, organizations can create diverse and creative workplaces where employees feel connected and supported (Jalil, 2017). Differences in knowledge, skills, and values among team members can sometimes lead to conflicts. However, project leaders can leverage Situational Leadership and Behavioural Leadership to navigate these differences, ensuring that conflicts are managed effectively and that collaboration is strengthened. By promoting the principles of Inclusive Leadership, leaders can enhance diversity management and conflict resolution within workgroups, ultimately driving project success.

2.4 Leadership in Organizational Success and Employee Engagement

Leadership plays a pivotal role in driving organizational success by aligning goals, fostering innovation, and enhancing employee engagement (Groysberg & Slind, 2012). Effective leaders contribute significantly to organizational growth by leveraging diverse talent, implementing innovative strategies, and optimizing performance outcomes (Nieto, Huang, Jackson, & Thiery, 2016). One of the essential qualities of impactful leadership is active listening, which builds trust among team members and reassures employees that their voices are valued (Javed, Khan, & Quratulain, 2018). Research has identified listening as a fundamental management skill, emphasizing its importance in leadership theory and its role in fostering a culture of inclusion and engagement.

Supervisors and managers hold significant influence over employee engagement, retention, and overall job satisfaction. Human resource (HR) professionals play a critical role in supporting leadership development by providing training and ensuring managerial accountability in maintaining high employee engagement levels. To enhance organizational effectiveness, HR leaders should integrate engagement metrics into managerial evaluations, encouraging leaders to create environments where employees feel heard, valued, and motivated (Scanlan & Johnson, 2015). A culture of open communication, where employees are encouraged to express work-related concerns, contributes to a more productive and harmonious workplace.

Empirical research underscores the strong correlation between leadership and employee engagement. A study by (Lloyd, Boer, Keller, & Voelpel, 2015) highlights that when employees experience autonomy, competence, and understanding through facilitated by effective leadership so that they exhibit higher levels of work engagement. Under the framework of social exchange theory, inclusive leaders who demonstrate openness, accessibility, and support provide employees with the necessary resources to thrive. In response, employees reciprocate by fully investing their emotional and physical efforts into organizational tasks, thereby improving performance and commitment.

Ultimately, leadership is not just about managing tasks; it is about inspiring employees,

fostering a sense of belonging, and driving engagement. By adopting inclusive leadership practices, organizations can cultivate a motivated workforce, enhance job satisfaction, and achieve long-term success.

2.5 Relationship Between Work Engagement and Project Management

Work engagement plays a crucial role in driving project management success. An engaged project team is more dedicated, motivated, and committed to achieving organizational objectives, which directly contributes to the efficiency and effectiveness of project execution. Engaged employees exhibit higher levels of trust, enthusiasm, and passion, leading to improved productivity, profitability, and customer focus. Additionally, they enhance workplace safety, demonstrate greater loyalty, and are more inclined to stay within the organization, reducing turnover and fostering long-term project stability (Groysberg & Slind, 2012).

The connection between work engagement and project management extends beyond individual performance. Engaged employees positively influence key stakeholders, including internal and external customers, by fostering collaboration and alignment with project goals. Effective communication from project managers and executives, particularly through a clear vision and well-defined objectives, enhances this engagement, ensuring that employees feel valued, informed, and appreciated. Project managers play a critical role in sustaining work engagement. Their enthusiasm and commitment set the tone for the project environment, influencing team morale and performance. A project manager who exhibits energy and passion can inspire team members, creating a work culture that fosters motivation and proactive problem-solving (Agarwal, Datta, Blake-Beard, & Bhargava, 2012). According to Harvard Business Review, organizations with highly engaged employees experience significantly higher project success rates than those with disengaged workforces. Engaged employees drive efficiency, enhance productivity, reduce operational costs, and increase project profitability, ultimately contributing to the organization's competitive advantage.

Moreover, work engagement directly impacts employee retention, a key factor in long-term project success. Organizations that invest in employee satisfaction and engagement are more likely to retain top talent, reducing job-hopping tendencies and ensuring a stable, skilled workforce. This stability enhances knowledge retention and fosters continuous improvement, further increasing the likelihood of project success (Tuckey, Bakker, & Dollard, 2012). Thus, work engagement serves as a critical component in achieving project management success. By fostering an engaged workforce, organizations can enhance productivity, stakeholder relationships, and overall project performance, ensuring sustainable growth and competitive resilience.

2.6 Mediating Role of Work Engagement

In recent decades, organizations have recognized that achieving project management success requires not only strong leadership competency but also active employee engagement. Work engagement plays a crucial mediating role in linking leadership competency with improved project outcomes, ensuring that employees are motivated, committed, and aligned with

organizational objectives (Brière, Proulx, Flores, & Laporte, 2015). Engaged employees contribute to higher productivity, better project execution, and enhanced managerial effectiveness, whereas disengaged employees tend to exhibit lower efficiency, reduced output, and increased operational costs (Javed, Naqvi, Khan, Arjoon, & Tayyeb, 2017). Leadership competency, which encompasses skills such as strategic decision-making, effective communication, and team motivation, is a key driver of employee engagement. Research highlights that various leadership styles such as authentic, transformational (Mehta, Kurbetti, & Dhankhar, 2014), and ethical leadership which positively influence work engagement by fostering an environment of trust, inclusivity, and motivation. Leaders who demonstrate accessibility, openness, and availability create a supportive work atmosphere where employees feel valued and empowered, increasing their willingness to dedicate mental, emotional, and physical resources to their tasks.

As a mediating factor, work engagement enhances the effectiveness of leadership competency by driving employee innovation, efficiency, and commitment to project goals. Engaged employees are more likely to contribute creative solutions and proactively address challenges, leading to higher project success rates (Carmeli, Dutton, & Hardin, 2015). Furthermore, the link between leadership competency and project outcomes is strengthened when work engagement is high, as it fosters a collaborative and performance-driven work culture. Thus, work engagement serves as a bridge between leadership competency and project management success, amplifying the impact of effective leadership on organizational performance. By prioritizing work engagement, organizations can maximize the benefits of strong leadership and ensure the successful execution of projects, ultimately achieving sustainable growth and competitive advantage.

3. Case Study and Data Collection

This study investigates leadership quality in manufacturing project management and aims to establish a leadership framework for enhancing project success. BOROUGE Manufacturing Company, a leading polyolefin solutions provider, is selected as the case study to examine leadership effectiveness in managing large-scale manufacturing projects. Founded in 1998 as a strategic joint venture between ADNOC and Borealis, BOROUGE operates one of the world's largest integrated polyolefin complexes, headquartered in Al Ruwais Industrial City, UAE. With a workforce of over 3,100 employees, the company serves more than 50 countries across Asia, the Middle East, and Africa. Its core expertise lies in producing high-performance polymer solutions for diverse industries, including advanced packaging, infrastructure, energy, mobility, healthcare, and agriculture. BOROUGE is primarily owned by ADNOC (54%) and Borealis (36%) under the leadership of CEO Abdulaziz Alhajeri.

In addition to its market leadership, BOROUGE integrates cutting-edge technologies such as Borstar and Borlink, developed by Borealis, to deliver innovative polymer solutions. The company is also committed to sustainability, addressing key global challenges such as climate change, food waste reduction, water accessibility, energy transition, healthcare advancements, and waste management (Awang, Afthanorhan, & Asri, 2015).

However, despite its strong industry position, BOROUGE faces several operational

challenges that impact manufacturing project management. According to Borouge (2024), economic fluctuations, such as the downturn in China's economy, significantly affect product demand. Additionally, the high cost of innovation and financial constraints pose challenges, as continuous improvement is crucial in the highly competitive petrochemical industry. Managing a global supply chain adds logistical complexities, while stringent environmental regulations and sustainability goals require careful compliance. Furthermore, market volatility due to fluctuations in oil and gas prices influences production costs and profitability, and rapid technological advancements necessitate continuous adaptation and integration into operations. Recognizing the critical role of leadership in overcoming these challenges, this study develops a leadership framework tailored to the needs of BOROUGE's manufacturing project management. The research employs a structured questionnaire survey, administered electronically using a simple random sampling technique. A total of 417 valid responses were analyzed to construct the framework model. The demographic profile of respondents is presented in Table 1.

Table 1. Respondents' Characteristics

Age	No.	Percentage
21–30	36	8.6
31–40	29	7.0
41–50	314	75.3
Over 50	38	9.1
Total	417	100.0
Education qualification		
Diploma/certificate	47	11.3
Bachelor degree	236	56.6
Master degree	121	29.0
PhD	13	3.1
Total	417	100.0
Length of service		
Less than 5 years	12	2.9
6–10 years	61	14.6
11–15 years	137	32.9
Above 15 years	207	49.6
Total	417	100.0
Position		
Executive	200	48.0
Manager/Head of Dept	143	34.3
General Manager/ Director	74	17.7
Total	417	100.0

Table 1 presents a detailed breakdown of their profiles, providing insights into the workforce composition and leadership experience within the organization. The age distribution of respondents reveals that the majority (75%) fall within the 41–50 age range, indicating a seasoned workforce with substantial professional experience. A smaller proportion (9.1%) is above 50 years old, while 15% of respondents are aged between 21 and 40 years. Regarding educational qualifications, more than half (56.6%) of respondents hold a bachelor's degree, while 29% possess a master's degree. Additionally, 11.3% have a diploma or certificate, and only 3.1% have earned a PhD. These figures suggest a highly educated workforce, which is essential for effective leadership in manufacturing project management. In terms of work experience, approximately half of the respondents have been in their current roles for more than five years. About 33% have served between 11 and 15 years, while 14.6% have worked in their positions for 6–10 years. A small fraction (2.9%) reported less than five years of experience in their current role, highlighting a workforce with extensive industry expertise. Position-wise, nearly half (48%) of the respondents hold executive roles, while 34.3% occupy managerial or head-of-department positions. The remaining 17.7% serve as general managers, directors, or chief executive officers. This distribution underscores the presence of experienced leadership within BOROUGE, aligning with the study's objective of developing a leadership framework tailored to manufacturing project management. By examining these demographic insights, the study provides a solid foundation for understanding the leadership composition at BOROUGE, offering valuable context for assessing the impact of leadership styles on manufacturing project success.

4. Modelling Analysis

The conceptual model for this study was developed based on a thorough literature review of leadership attributes that contributed to success in manufacturing project management. This model incorporated both direct and indirect relationships between various constructs. In the direct relationships, leadership attributes were considered the independent variables, while Project Management Success was the dependent variable. The leadership attributes included situational leadership, competency leadership, servant leadership, and behavioural leadership. For the indirect relationships, work engagement acted as a mediator between leadership attributes and Project Management Success. Once the conceptual model was established, it was empirically validated using collected data. The statistical assessment was conducted using the Analysis of Moment Structures (AMOS) software, which integrates all constructs into a single structural equation model (SEM). AMOS is a powerful tool used for structural equation modelling, allowing researchers to assess the fit of their conceptual model to the observed data (Barnidge & De Zúñiga, 2017). It provides estimates of the relationships between the constructs, evaluates the overall model fit, and tests the significance of individual paths within the model. The use of AMOS software ensures that the complex interrelationships among the constructs are accurately represented and statistically tested, providing robust empirical support for the proposed conceptual model.

As shown in Figure 1, certain fitness indices for the structural measurement model do not reach acceptable levels for goodness-of-fit (Ghadi, Fernando, & Caputi, 2013). The observed factor loadings for all were above 0.5, although fitness indexes were sometimes

below the recommended level. Therefore, modification indices were examined to identify redundant items and they were correlated with improvement of the model's goodness-of-fitness indices.

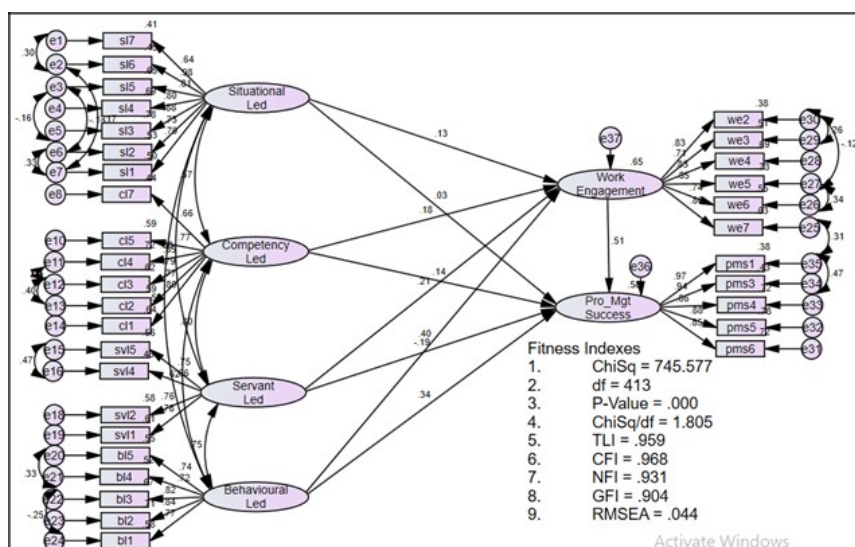


Figure 1. The final constructs and goodness-of-fitness for structural model

Table 2, the goodness-of-fitness for the structural measurement models presented in the figure shows progressive improvement until an acceptable level is realized. The final structural measurement model provided an analysis of the causal effect (impact) for the multiple constructs in the path diagram. First and foremost, the fitness indices for the structural model reflect how fit the hypothesized model is; it was observed to be satisfied within the established acceptable level (Anitha, 2014).

Table 2. The Fitness Indices of the Structural Model

Fitness Index	Level of Acceptance	Index Value	Comments
Chisq/df	Chisq/pdf ≤ 3	1.436	Fitness index achieved.
TLI	TLI ≥ 0.9 means satisfactory	0.934	Fitness index achieved.
CFI	CFI ≥ 0.9 means satisfactory fit.	0.939	Fitness index achieved.
NFI	NFI ≥ 0.80 suggests a good fit	0.824	Fitness index achieved.
GFI	GFI ≥ 0.80 suggests a good fit.	0.801	Fitness index achieved.
RMSEA	RMSEA ≤ 0.08 mediocre fit.	0.040	Fitness index achieved.

The standard regression weights indicate the estimated beta coefficient, which measures the impacts of the main constructs: exogenous variables on the intervening variable and

endogenous variable. AMOS produced two types of textual output: standardized regression weights and unstandardized regression weights for the path analysis. The former is adopted to explain the relationships among all the constructs in the research model, and subsequently to test the hypotheses in the research, as it is easier to interpret (Anitha, 2014).

4.1 Testing of Research Hypotheses

The comprehensive review of literature facilitated the earlier presented hypothesized research model in Figure 1. The hypothesized result in Table 3 outlined the outcome of every respected path in the structural measurement model.

Table 3. The summary of hypotheses testing of direct relationship

Hypothesis statement of direct relationship	β value	P-value	Result
Situational leadership is directly significant effect on project management success	.034	.459	Not Significant
Competency leadership is directly significant effect on project management success	.150	.019	Significant
Servant leadership is directly significant effect on project management success	-.212	.013	Significant
Behavioral leadership's is directly significant effect on project management success	.362	***	Significant

As shown in Table 3 situational leadership has no significant effect on project management success ($\beta = .034$; CR = .742; $p = .459$), hence the hypothesis is not supported. On the other hand, the hypothesis that postulated that competency leadership has a significant effect on project management success is supported ($\beta = .150$; CR = 2.352; $p = .019$). Similarly, servant leadership is found to have a significant but negative effect on project management success ($\beta = -.212$; CR = -2.482; $p = .013$) while behavioural leadership also indicated a positive significant effect on project management success ($\beta = .362$; CR = 5.691; $p < .05$).

Table 4. The summary of hypotheses testing for indirect relationship

Hypothesis statement of indirect relationship	β value	P-value	Result
Situational leadership is indirect significant effect on project management success through work engagement.	.105	.034	Significant
Competency leadership is indirect significant effect on project management success through work engagement.	.091	.123	Not Significant
Servant leadership is indirect significant effect on project management success through work engagement.	.108	.169	Not Significant
Behavioural leadership is indirect significant effect on project management success through work engagement.	.204	.002	Significant

Table 4 shows that work engagement significantly mediates the relationship between situational leadership and project management success ($\beta = .105$; 95% CI: .013 ~ .118; $p = .034$). Similarly, work engagement shows a significant mediating effect on the relationship between behavioural leadership and project management success ($\beta = .204$; 95% CI: .130 ~ .294; $p = .002$). On the other hand, the result shows no significant mediating effect in the relationship between competency leadership and project management success ($\beta = .091$; 95% CI: -.006 ~ .188; $p = .123$), and between servant leadership and project management success ($\beta = .108$; 95% CI: -.020 ~ .241; $p = .169$).

4.2 Determination of Mediation Effect

Mediation effects describe the process through which an independent variable influences a dependent variable via a mediator. Partial mediation occurs when the mediator accounts for part of the relationship between the independent and dependent variables, while a direct connection between them still exists. In contrast, full mediation takes place when the mediator entirely explains the relationship, eliminating any direct link between the independent and dependent variables. Researchers commonly use methods such as the Baron and Kenny (Baron & Kenny, 1986) approach, the Sobel test, or bootstrapping techniques to assess mediation effects and determine the significance of indirect effects (Preacher & Hayes, 2008). This study's mediation hypothesis investigates the role of work engagement as a mediator in the relationship between different leadership styles and project management success in the manufacturing sector, as shown in Table 5.

Table 5. Statement of mediation hypothesis

Statement of mediation hypothesis	Direct	Indirect	Mediation effect
Work engagement mediates the relationship between situational leadership and project management success	Not Significant	Significant	Full effect
Work engagement mediates the relationship between competency leadership and project management success	Significant	Not Significant	No effect
Work engagement mediates the relationship between servant leadership and project management success	Significant	Not Significant	No effect
Work engagement mediates the relationship Behavioural leadership and project management success	Significant	Significant	Partial effect

The results in Table 5 indicate that situational leadership had a fully mediated relationship with project management success through work engagement. This suggests that in the manufacturing environment, situational leaders who adapt their style to meet the demands of specific situations can significantly enhance project management success by fostering high levels of work engagement among their team members (Chow, Zailani, Rahman, Qiannan, Bhuiyan, & Patwary, 2021). On the other hand, both competency leadership and servant leadership showed a significant direct effect but no mediating effect of work engagement on project management success. This implies that while leaders who possess strong

competencies and serve their team members can directly influence project outcomes, these leadership styles do not necessarily enhance work engagement to drive project success in the manufacturing context (Kuen, Zailani, & Fernando, 2009; Fraz, Waris, Afzal, Jamil, Shah, & Sultana, 2016). It highlights the importance of direct interaction and support from leaders in these styles to achieve project management success without relying on the intermediary effect of work engagement. Conversely, behavioural leadership demonstrated a partially mediated relationship, indicating that this leadership style directly influences project management success and, to some extent, through work engagement. In manufacturing project management, leaders who exhibit positive behaviours, such as clear communication, motivation, and support, not only drive project success through their actions but also enhance work engagement, which in turn contributes to project outcomes (Burawat, 2019; Birasnav, 2014; Broadberry, 1994). Overall, these findings underscore the critical role of leadership attributes in driving project management success in the manufacturing sector. Situational leadership stands out for its ability to leverage work engagement fully, whereas competency and servant leadership depend more on direct leader influence. Behavioural leadership benefits from both direct influence and the enhancement of work engagement. These insights provide valuable guidance for manufacturing project managers to adopt appropriate leadership styles to optimize project outcomes effectively.

5. Established Empirical Framework

An empirical framework is built on observable and measurable evidence, enabling the evaluation of hypotheses or the formulation of conclusions within a specific field of study. In this research, the framework is developed using observed data from employees of BOROUGE, a manufacturing company in the UAE, and is rigorously validated through modelling analysis. As illustrated in Figure 2, the framework captures both direct and indirect relationships between leadership styles and project management success, with work engagement acting as a mediating factor within BOROUGE manufacturing organisation.

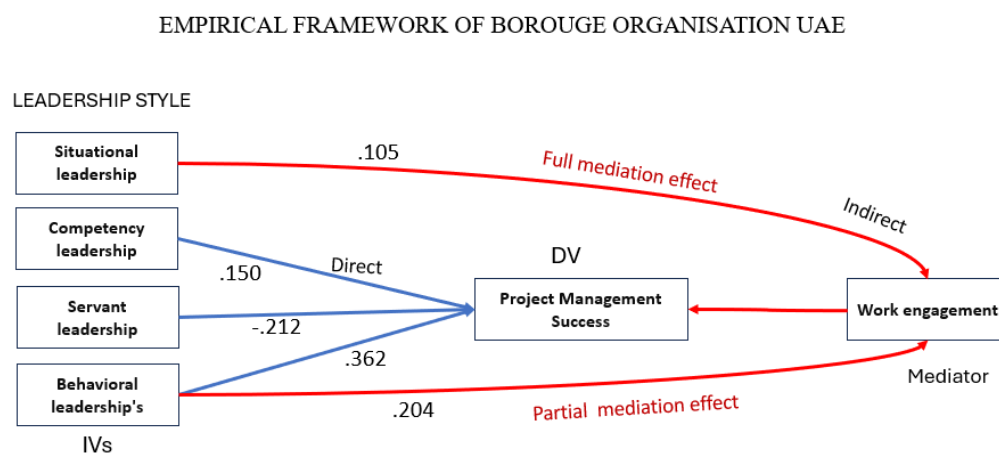


Figure 2. The Established Framework

The empirical framework identifies three leadership styles as significant contributors to project management success: competency leadership, servant leadership, and behavioural leadership. However, situational leadership does not show a direct impact. The path strengths for competency, servant, and behavioural leadership are 0.150, -0.212, and 0.362, respectively. Competency leadership, which emphasizes leaders' skills and abilities, has a positive path strength of 0.150, indicating a direct but moderate influence on project success. Servant leadership, characterized by leaders who prioritize the needs and development of their team members, has a negative path strength of -0.212, suggesting a complex and potentially context-dependent effect. Behavioural leadership, which focuses on leaders' actions and behaviours, exhibits the strongest positive path strength of 0.362, highlighting its substantial impact on project success.

Regarding indirect relationships, only situational leadership and behavioural leadership show significant mediation effects, with path strengths of 0.105 and 0.204, respectively. The mediation effect of work engagement is full for situational leadership, meaning that its entire impact on project success occurs through its influence on employee engagement. In contrast, the mediation effect for behavioural leadership is partial, indicating that while behavioural leadership directly enhances project outcomes, part of its impact is also mediated through work engagement. This suggests that behavioural leadership not only contributes directly to project success but also fosters higher employee engagement, further enhancing outcomes. To ensure the empirical framework is relevant to BOROUGE organisation, it has to aligned with the company's unique context, objectives, and operational environment. This includes emphasizing the impact of leadership styles on operational efficiency and project success, supported by employee data and case studies. The role of work engagement as a mediating factor is crucial, and its influence should be validated through empirical evidence and path strengths. Justifying indirect relationships and mediation effects strengthens leadership practices, while actionable recommendations and continuous monitoring help maintain the framework's relevance and effectiveness in response to evolving business dynamics.

6. Conclusion

The empirical framework established in this study confirms that competency leadership, servant leadership, and behavioural leadership significantly influence project management success, while situational leadership does not have a direct impact. Among these, behavioural leadership has the strongest positive effect, whereas servant leadership shows a negative influence, indicating a complex relationship. Regarding indirect effects, situational and behavioural leadership exhibit significant mediation through work engagement. Situational leadership impacts project success solely through work engagement, while behavioural leadership has both a direct effect and an additional indirect influence via work engagement. These findings underscore the critical role of leadership styles in shaping project outcomes at BOROUGE. They highlight the importance of fostering behavioural leadership and enhancing employee engagement to maximize project success. Continuous evaluation and alignment with organizational goals will ensure the framework remains relevant and effective over time.

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