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An Empirical Study on Project Managers' Leadership Behavioral Practices Impacting Project Success – The Australian Construction Sector

Ashok Rehan, David Thorpe, and Amirhossein Heravi

School of Surveying and Built Environment, University of South Queensland, Toowoomba, Queensland, Australia

ABSTRACT

The study aims to bridge the gap for an in-depth empirical analysis by investigating the project managers' leadership behavioral practices, helping practitioners tackle unique challenges in the Australian construction sector. A quantitative approach was employed using a survey questionnaire to collect responses from (66) project managers/leaders. Exploratory factors/multivariate regression has identified four key success factors: (1) Relationship Management, (2) Leading by Example, (3) Self-Management, and (4) Interpersonal Sensitivity and thirteen contributing leadership practices, emphasizing inclusiveness, relationship-building, self-feedback objectivity, sharing information, and controlling emotions that significantly impact project success. Synthesizing information indicated transformational, transactional, and authentic styles of leadership practices and an inclination to adopt innovative behaviors promoting positive change for achieving project success. Besides, the study found remarkable differences in the project leadership practices from those extracted from global research studies, suggesting future investigation. The study's results addressed the challenges experienced in the construction industry: delays and inefficiencies, supply chain management, communication barriers with a multicultural workforce, stringent government regulatory and safety compliance, infrastructure demands, skills shortages, sustainability, organization culture, and new technology adoption. It will significantly contribute to the body of knowledge by generating valuable insights and perspectives for a deeper understanding of construction-related practices for the practitioners.

KEYWORDS

Communication; leadership practices; project success; success factors

Introduction

In the competitive and complex construction sector, project-based organizations continually seek value-added practices and success factors to gain a competitive edge. Project management professionals struggle with numerous challenges, including design complexity, varying stakeholder expectations, and a shifting construction landscape,

CONTACT Ashok Rehan ashokrehan@gmail.com School of Surveying and Built Environment, University of South Queensland, Toowoomba, Queensland, Australia

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which have been further compounded by the COVID-19 pandemic, introducing uncertainties like cash flow disruptions, schedule delays, health-related issues, and travel restrictions (Phillips et al., 2022). Moreover, as projects become more intricate and face demands from meeting stringent government regulations and stakeholders' evolving expectations, traditional management models need help to keep pace (Froese, 2010; Sepasgozar et al., 2016). The significance of intangible elements such as leadership behavioral practices, project communication, interpersonal relationships, and relationship and conflict management have emerged as critical dimensions to achieving success in the construction sector.

Despite the utilization of modern project management techniques, research has shown that a majority of project-based companies in the construction industry experience challenges like cost overruns, schedule delays, quality issues, and stakeholder dissatisfaction (Gebrehiwet & Luo, 2017; Hasib & Al-Kilidar, 2021). This underscores the importance of leadership and communication practices, relationship building, trust development, emotional intelligence, stakeholder management, and conflict resolution (PMBOK – v7, 2021) in project success.

Project failures are common in the global construction industry, and the Australian construction sector is no exception. The significance of leadership behavioral competencies in enhancing project management professionals' understanding of their linkages to effective project performance is widely acknowledged (Dainty et al., 2005). Effective leadership is essential for achieving successful project outcomes, as highlighted by (PMBOK, 2021), which emphasizes leadership traits such as vision, creativity, motivation, enthusiasm, encouragement, and empathy to support better project outcomes.

Leadership in project management research has gained prominence as a crucial element in delivering successful construction projects. For instance, Sampaio et al. (2022) emphasized leadership as a core competency for project managers. Gruden and Stare (2018) identified influential behavioral characteristics like leadership, results orientation, assertiveness, reliability, and efficiency, confirming their impact on project delivery. Moradi et al. (2020) noted that project managers' leadership and communication significantly influence project success, and (Alvarenga et al., 2019) highlighted the importance of soft skills such as leadership and communication in successful project management.

The Australian construction industry faces various challenges, including infrastructure demands, geographical and environmental considerations, cost pressures, technological advancements, skills shortage and worker turnover, community and indigenous engagement, project manager's competencies, disruptions in the supply chain, and quality and safety concerns (Infrastructure Australia, 2022; KPMG, 2022), necessitating a different and comprehensive approach to understand leadership and communication's role in achieving project success. Additionally, ongoing challenges in the construction industry include (1) delays and inefficiencies, (2) material supply chain problems, (3) communication barriers in a multicultural workforce, (4) automation adoption, and (5) mental health. However, there remains a gap in empirical studies addressing the impact of leadership behaviors and communication on project success in the construction sector, especially regarding these sector-specific challenges. This study aims to fill this void by investigating key success factors related to leadership behavioral practices and communication, offering insights to overcome these challenges and drive project success. In addition, Stevenson and Starkweather (2010) and Gruden and Stare (2018) call for comprehensive research on

project managers' leadership practices to improve understanding of the characteristics of leadership practice to achieve project success.

This paper presents research on leadership behavioral practices in the Australian construction sector, offering a global comparative analysis. Based on data collected on 66 projects from project managers, the empirical study identifies key success factors and leadership behavioral practices, enhancing practitioners' understanding of leadership's role in project success and how project managers' behavioral practices mechanism influence outcomes. This study further identifies the five most commonly used leadership behavioral practices among project managers from Relative Importance (mean) Analysis: Working diligently to achieve goals, Keeping commitments and promises, Setting high-performance standards, Leading by behavioral example, and Building and maintaining relationships to achieve shared goals.

The subsequent sections include a literature review, research methodology, data analysis details, discussions on results, theoretical and practical contributions, and concluding remarks.

Literature review

Leadership is viewed as influencing a group of followers to achieve predetermined goals and objectives using effective communication (Famakin & Abisuga, 2016). Liphadzi (2015) addressed leadership as a vital element in the performance of any organization and even more critical to the construction sector due to its complexity. Some scholars conceptualize leadership in terms of behavior or personality, while others view it from a social information processing standpoint (Northouse, 2021, cited in; Peng et al., 2022). Project management literature has documented leadership as a vital skill of influential project leaders since the beginning of the 21st century (Odusami et al., 2003). However, due to the changing environment of the construction industry, the realization of the people side of project management, the challenges of globalization, new markets, changing demographics, new technologies, and multidimensional complexities in projects are transforming the focus of construction leaders to new competitive approaches and strategies, and the adoption of new practices (Toor & Ofori, 2008). For several years, the paradigm of construction leaders has been technology and project-oriented and focused mainly on management (Pries et al., 2004). However, in recent years, the importance and role of leadership in delivering successful construction projects have been recognized. Though the importance of leadership has been accepted in the project management literature, researchers often emphasize technical factors in determining a project's success or failure rather than addressing leadership and management styles and practices (Toor & Ofori, 2008). Although leadership contributions to project success and failure have been researched extensively, discussions continue to provoke debate. In the construction industry, project managers contend with rigorous government regulatory requirements, diverse suppliers and sub-contractors' relationships, and the intricate dynamics of project teams and stakeholders, amplifying their pressures. Given this complex landscape, evolving tasks and operational environments underscore the need for effective leadership in the construction sector (Ofori & Toor, 2021).

An ongoing debate in the leadership domain underscores the prevalence of project failures globally (Anantatmula, 2010; Aziz & Hafez, 2013), compelling project managers to constantly refine leadership practices and strategies to bolster project success within the

construction sector. Research in leadership continues to evolve, and new perspectives and approaches are being explored to elucidate the role of leadership behavioral practices and communication in achieving project success amid evolving technology and construction methods. Continuous changes in the construction sector have placed greater demands on traditional management models and have necessitated a focus on key project success factors. The VUCA environment (Volatility, Uncertainty, Complexity, and Ambiguity), exacerbated by factors like COVID-19, has exposed the fragility of supply chains across the construction sector, emphasizing the need for adaptive leadership in the face of unpredictability. Despite technological advancements enhancing project management, challenges arise from emerging technologies, artificial intelligence, and the BANI (Brittle, Anxious, Nonlinear, and Incomprehensible) environment (Ray, 2023). Construction leaders must embrace agile and authentic leadership, fostering collaboration, creativity, adaptability, and resilience among team members to thrive in the VUCA and BANI landscape. The industry's unique challenges necessitate innovative project management practices, especially amid talent shortages, increased costs, disruptions, safety concerns, and technological advancements. Construction organizations need to identify key project success factors for leadership practices and communication that match the complexity and constant change and manage the application of digital technologies. This study aims to address the literature gap by examining the impact of leadership practices and communication on project success, offering actionable insights and prompting project managers to devise creative strategies for navigating the multilateral complexities (Wang, 2014, cited in; Xiao et al., 2019) of the Australian construction landscape.

The construction industry confronts various challenges, encompassing exacting client expectations, stringent regulations, disruptions in the supply chain, health and safety compliance, fierce competition, and the emergence of disruptive enterprises. Established leadership theories and frameworks, such as Transformational, Transactional, Servant, Situational, Strategic, Authentic, Authoritarian, and Participative leadership, offer a conceptual foundation for exploring the relationships between leadership practices, communication, team dynamics, project performance, and project success. Common themes in these frameworks include effective leadership, relationship building, communication, vision, team cohesion, collaboration, stakeholder management, and their impact on project objectives. These frameworks empower project managers to understand various leadership styles and practices, enabling them to devise strategies to address the challenges specific to the construction industry. Project success has been a central research and practice focus for several decades. The "Iron Triangle" (comprising cost, time, and quality) served as the primary yardstick for measuring project success and performance (APM, 2018; Atkinson, 1999). Subsequently, success measurement criteria expanded to encompass client satisfaction, suppliers' and stakeholders' contentment, organizational and team benefits, alignment with strategic objectives, and overall business success (Shenhar et al., 1997).

Project success and success factors

Project success revolves around identifying key success factors that elevate project quality, efficiency, and effectiveness. Per Rockart (1982), critical success factors denote the essential areas of excellence project managers focus on to attain their objectives. These factors enable project managers to concentrate on predefined goals that can directly or indirectly support

project success. The evaluation of project success encompasses diverse criteria, including satisfaction of end users, suppliers, teams, and stakeholders; alignment with user requirements; fulfillment of the project's purpose; customer contentment; recurrent business; and adherence to project-defined success criteria. Several studies have delved into project success factors, encompassing technical facets (Atkinson, 1999; A. Chan et al., 2004; Jha & Iyer, 2006) and the impact of project management techniques (A. Chan et al., 2004; Jha & Iyer, 2006; Munns & Bjeirmi, 1996).

The Project Management Institute has recently defined project success as the outcomes of adapting to a project's unique context, objectives, stakeholders, governance, and environment while optimizing processes, value, cost management, and speed (PMBOK-v7, 2021, p. 44). However, the term "success" is a multifaceted indicator subject to varying interpretations by individuals and organizations (Samset & Voldon, 2012, cited in Williams & Samset, 2012). It is also measured differently depending on project types and short-or long-term objectives. Project success remains a complex and variable concept influenced by numerous factors, including changing stakeholder demands, market dynamics, environmental fluctuations, complexity, and project ambiguity, which makes defining and evaluating project success even more complicated (Wiewiora & O'Connor, 2022).

Project manager

The project manager is pivotal in driving project success by overseeing the project, managing the team and stakeholders, and influencing project outcomes. Effective interactions among success predictors, relationship management, and conflict resolution enhance project success. Leadership is highlighted as a key success factor in the project manager's role, and the evolving technological landscape requires them to formulate new strategies and processes to deliver quality projects (Xiao et al., 2019).

There is a growing recognition of the significance of project managers' behavioral practices, skills, and characteristics in project management (Gruden & Stare, 2018). Some studies even assert that these factors are among the most critical contributors to project success (Sang et al., 2018, cited in; Sampaio et al., 2022). Behavioral practices and skills such as leadership, organization, target management, and emotional intelligence have been identified as crucial factors influencing project performance (Sang et al., 2018). An analysis of the literature review underscores that a project manager's leadership skills, behavioral practices, and communication skills significantly impact project success. Researchers found that the human-related skills of project managers have the most significant influence on project management practices, along with technical skills (Ahsan et al., 2013; Ruuska & Vartiainen, 2003). The literature has described communication as an essential tool for the project manager in their pivotal function of connecting and mediating many elements involved in a project. Gruden and Stare (2018) identified the most influential behavioral dimensions/characteristics (e.g., leadership, results orientation, assertiveness, reliability, and efficiency) and substantiated their influence in enhancing successful project delivery (Sampaio et al., 2022).

Given the above discussion, project managers must consistently adopt appropriate leadership and communication practices and strategies to counter challenges in the complex construction environment.

The above discussion leads us to the following research questions for this study.

Research questions

(1) What are the project managers' perspectives and viewpoints on leadership behavioral practices in the Australian construction sector, and how do these compare with the global behavior practices in the project construction sector?
(2) How can key success factors contribute to meeting the unique challenges the construction industry faces?
(3) What are the project managers' top-ranked leadership behavioral practices for achieving project success in the construction sector?

Research methods

(1) The study employed a quantitative approach due to its reliability and efficiency in gathering substantial, objectively analyzable data, bolstering result generalization and reliability. This method aligns with the research's objectivity, given that it aims to probe the relationship mechanisms between leadership practices and project success (Curtis et al., 2016). Additionally, it upholds the data's authenticity and reliability through a meticulously structured questionnaire. A random sampling technique was chosen, ensuring each individual in the target population has an equal likelihood of survey selection. This population comprises project managers, the respondents (rated on a Likert Scale 1–5) for this study.
(2) As delineated in the prior literature review, the study consequently selected five fundamental constructs for data analysis, encompassing a dependent variable (project success) and four independent variables measuring project success. These constructs were further expanded based on behavioral practice attributes (Table 1) uncovered during the literature review to develop a survey questionnaire for data collection.

Development of research questionnaire and data collection

The researchers used identified behavioral practices attributes (Table 1) to develop a 74-item survey questionnaire to collect data from the target population for this cross-sectional study. Core variables measurements were operationalized through various dimensions: Leadership Practices: Fourteen dimensions were included: inspire-motivation, shared vision, mentoring relationships, cooperating relationships, truthfulness, leading by example, coaching, empowerment, encouragement, self-awareness, self-management, interpersonal sensitivity, influence, and flexibility (Arnold et al., 2000; Bass & Avolio, 2000; Seedman, 2015). A scale of 32 item was used to measure this variable. The items adopted, for example: "I inspire and motivate the project team to work together to achieve project goal/s" and "I set a good example of my behavior (communication and listening skills) with my project team and stakeholders." Communication: Four dimensions were examined, covering formal communication, informal communication, communication willingness, and communication effectiveness (Clark, 2010; Muszynska, 2018). This variable was

Table 1. List of identified attributes from research studies literature review.

Identified Attributes				
1. Leadership Practices • Relationships • Motivation • Influence. • Visionary • Goal Oriented. • Trust, • Encouragement, • Communication • Inspire • Task-Oriented • Team Building • Stakeholders • Empowerment • Commitment • Emotions • Effective Communication • Conflict Management • Flexibility • Self-Management • Coaching • Goal Setting • Share Information • Self-Awareness • Seeking Feedback • Sensitivity • Leading by Example • Caring Others • Empathy • Self-Development • Humility.	2. Communication • Formal communication • Informal communication • Frequency of communication • Respect each other's viewpoints. • Share events and Changes willingly. • Follow a trust communication mechanism. • Defined communication purpose • Clear communication without any ambiguity. • Understand communication with others. • Knowledge of audience to communicate. • Current & meaningful information • Proper methods/media/channels. • Achieved the expected outcome. • Open and honest communication • Tailor communication routines to the specific stakeholders • Communication barriers	3. Relationship Management • Sense others' developmental needs • Inspire individuals and groups. • Use effective communication/tactics. • Lead people in a new direction. • Manage change. • Negotiate in resolving disagreements collaboratively. • Work to build and maintain relationships with others.	4. Conflict Management • Respect others' perspectives. • Recognize conflict in an early stage. • Encourage all parties to communicate willingly. • Resolve conflict amicably. • Work effectively to resolve. • Solve relationship issues. • Build consensus. • Manage ambiguous situations. • Maintain self-control.	5. Project Success • The project was completed on time. • The project was completed within the budget. • The project met the quality needs. • Performance achieved to the team's satisfaction. • Managed to the satisfaction of all project stakeholders. • Achieved end users. Satisfaction. • Ensure the satisfaction of the suppliers involved • Achieved the project's purpose. • The project fulfilled its success criteria. • Implement a safety culture. • The project met sustainability-dimensions.

measured using 16 items. For example, "I keep the purpose of communication well-defined & meaningful" and "I keep open and honest communication with all project teams and stakeholders." ."Relationship Management: Seven dimensions were included: leadership inspiration, developing others, influence, change catalyst, conflict management, building bonds, teamwork, and collaboration (Goleman, 1998). A six-item scale was used to measure relationship management. For example, "I inspire and guide individuals and groups" and "I negotiate in resolving disagreements and collaboratively develop a resolution." Conflict Management: Seven dimensions comprised viewing other perspectives, early conflict identification, amicably resolving, working effectively with organization policies, consensus building, managing ambiguous issues, and self-control maintenance (Clark, 2010; Maqbool et al., 2017). Project Success: Seven dimensions encompassed time, cost, quality, end users' satisfaction, team members' satisfaction, meeting business objectives, and all other project stakeholders' satisfaction (Müller & Turner, 2010) in this study. An 11-item

scale was used to measure this variable. For example, "I managed and satisfied all project stakeholders with the project deliverables," and I met the quality needs and requirements of the customers for the project."

Respondents demographics (project managers)

Data collected from (66) respondents, a mix of project managers/leaders from leading contractors and clients from public and private sector companies engaged in multistory buildings, residential complexes, office complexes, water and sewerage structures, and rail construction work across the New South Wales, Queensland, and Victoria states in Australia. Among these, 50% fell into the 50+ age group and had a master's degree as their highest educational qualification. Furthermore, 31.8% of respondents had 20–30 years of professional experience in the construction industry (Table 2). The demographic profile of experienced professionals with advanced engineering degrees lends substantial credibility to the data collected for this study, making it a reliable source of information.

Population and sampling techniques

The target population was project managers/leaders from the Australian construction sector. The study questionnaire was distributed randomly using online business-oriented networking LinkedIn sites, the Project Management Institute chapters of New South Wales/Queensland/Victoria, and the Engineers Australia, Queensland Division. Of 200 online questionnaires

Table 2. Respondents (project managers) demographicsrespondent number = 66.

Characteristics	Category	Frequency	Percentage (%)
Age	<30 Years	Nil	Nil
	30–40 Years	8	12.1
	40–50 years	25	37.9
	>50 Years	33	50.0
Designation	Project Manager	32	48.5
	Project Leader	34	51.5
Education Background	Diploma	1	1.5
	Bachelor's Degree	26	39.4
	Master's Degree	33	50.0
	PhD	3	4.5
	Job Experience	5	4.5
Professional Experience in Construction Industry	10 Years	7	10.6
	10–20 Years	17	25.8
	20–30 Years	21	31.8
	30–40 Years	4	13.6
	>40 Years	12	18.2
Professional Experience as Project Manager/Project Leader	10 Years	18	27.3
	10–20 Years	26	39.4
	20–30 Years	14	21.2
	30–40 Years	6	9.1
	>40 Years	2	3
Project Site Location	Single Site	21	31.8
	Multi-Sites	45	45
Project Complexity	Low	4	6.1
	Medium	31	47
	High	31	47

distributed, 98 (49%) responses were received within six months, of which 66 (33%) were sound and completed responses. The response rate was reasonable compared with the 20–30% norm for most construction industry questionnaire surveys (Akintoye, 2000). A sample size of (50–100) observations is adequate for conducting an exploratory factor analysis and simple regression analysis in most research situations (Hair et al., 2018, cited in Memon et al., 2020). Dulaimi et al. (2003) reported a 5.91% response rate for their research survey due to the lack of participation from the construction industry. Based on the above discussion, sixty-six (66) responses for this research seem adequate for the study's data analysis.

Content validity

The questionnaire's content validity was ensured before wide distribution by seeking input from five expert practitioners familiar with the study's constructs. These experts included a PhD academic from an Australian University and four senior managers holding master's engineering degrees, representing public and private sector companies engaged in various construction projects. Their feedback was instrumental in refining the language of the four questionnaire questions. The final questionnaire was distributed to project managers/leaders on a broader scale. All items were assessed using a five-point Likert scale (1–5), ranging from "strongly disagree" to "strongly agree."

Data analysis, techniques, and results

The data processing involved screening for missing values and outliers, normality check (skewness and kurtosis), parametric and nonparametric data distribution, multi-collinearity, common method bias, assessing reliability and validity measures for questionnaire and constructs, and conducting correlations and multivariant regression analysis. A normality check was conducted for skewness and kurtosis, and calculated values were found to be within recommended ranges of (+1 to – 1) and (+3 to – 3), respectively (George & Mallery, 2010). Next, the data were checked for missing values randomness (Tabachnick & Fidell, 2001). The missing values were within the 0.4 to 10% range, so imputation using the Expectation maximization method technique (Hair et al., 2010) was performed. In addition, Harman's single one-factor analysis for common method bias found (33.18%<50%-threshold value) variance in squared loadings, confirming no bias in the questionnaire. Cronbach's alpha(α) was used to measure the constructs' internal consistency (reliability). Anderson and Gerbing (1988) advocated Cronbach's alpha value of 0.7 and above for data analysis. Cronbach's values (α) for all the constructs (leadership practices-0.936, communication-0.877, relationship management-0.758, conflict management-0.774, project success-0.804, and overall-0.926) indicated an adequate internal consistency for this study. The validity of the questionnaire was tested using Pearson's correlation coefficient (r) values with the critical Pearson's coefficient value at the 95% confidence level, and correlation values were found to satisfy the criteria.

Construct validity

Construct validity, which assesses whether dimensions adequately measure the construct, was evaluated through principal components factor analysis on project managers' responses. Exploratory factor analysis (EFA) was performed to uncover the underlying

interrelationships among the variables in this study. The factor analysis revealed 13 underlying/latent factors from 74 items (Table 3). The process was used for each construct to test its convergence/discriminant validity. The analysis results show a Kaiser-Meyer-Olkin test value (KMO-a measure of sampling adequacy) of 0.792 for (communication, relationship, and conflict management) and 0.750 for leadership practices variables, respectively, and the values lie between 0.5–1.0 (Malhotra, 2008), hence indicating the appropriateness of factor analysis. Furthermore, the "statistical test for Bartlett's sphericity was found significant. Latent/underlying factors were extracted and retained with factor loadings greater than 0.5 (Hair et al., 1995) and eigenvalues greater than 1.0. Several rotations were performed on each construct to remove the cross-loadings. The extracted factors demonstrated high internal consistency and convergent validity. Leadership practices comprised nine latent factors (LBSF1 to LBSF9), explaining 72.36% of the variance, while communication, relationship management, and conflict management encompassed four factors (CMSF1 to CMSF4), explaining 64.21% of the variance. Principal component extraction analysis reduced 74 items (original) in the questionnaire to 42 items for the latent/underlying factors. Multivariant regression and Relative Importance (Means) analyses were employed to identify key success factors and top-ranked leadership behavioral practices in the construction sector.

Analysis and results

Pearson's correlation analysis revealed statistically significant and positive relationships between core variables and project success: Leadership Practices ($r = 0.567^{**}$, $p < .000$), Communication ($r = 0.638^{**}$, $p < .000$), Relationship Management ($r = 0.628^{**}$, $p < .000$) and Conflict Management ($r = 0.629^{**}$, $p < .000$). The empirical findings support positive relationships among leadership practices, communication, relationship, and conflict management with project success.

Key success factors – multivariate/stepwise regression

Multivariate regression is a method to understand the relationships among variables in the dataset. Multiple stepwise regression was performed to explore the relative influence of the factors extracted from factor analysis. Stepwise regression is used for variable evaluation by examining them as predictors in different models. It provides the advantage of being a simple, unconstrained, easily implemented function. Chan et al. (2004) used a similar research methodology to identify critical success factors for design-and-build construction projects in Hong Kong. A backward stepwise regression technique was used between 13 underlying factors (identified in EFA analysis) as predictors and project success as a dependent variable to identify key success factors in this study. The backward stepwise regression is a stepwise regression approach that begins with loading the full model and, at each step, gradually eliminates the least significant variables one after the other from the regression model during the iteration process to find a reduced model that best explains the data. The least significant variable is the variable with the highest p-value in the model, and its removal will cause the lowest drop in (R square). The backward model has the advantage of considering the effects of all the variables simultaneously, especially in the case of collinearity, compared to the forward selection,

Table 3. Summary of extracted latent/underlying factors.

Extracted Factors	Factor Loading	%Age of Variance Explained	Cumulative %age Variance Explained
LBSF1: Team Encouragement and Empowerment			
10. I show concern & care about our team member's well-being & show empathy and compassion	0.722		
17. I encourage my team members to express new ideas/opinions/ suggestions for continuous improvement	0.717		
20. I am conscious of my project team's contribution and appreciate their efforts to the project's success.	0.620		
28. I praise and appreciate team members' contributions individually for the job well done.	0.629		
29. I am aware of my limitations and appreciate my team members' strengths and contributions in helping me to engage with them	0.561	35.161	35.161
LBSF2: Leading by Example			
8. I set a good example of my behavior (communication and listening skills) with my project team and stakeholders	0.567		
11. I set high standards for performance for myself and adhere to the agreed-upon standards.	0.641		
14. I work hard to achieve the project goals.	0.640		
16. I keep my commitments and promises to those I work with.	0.676	7.242	42.408
LBSF3: Interpersonal Sensitivity			
24. I have an awareness and ability to recognize the feelings and emotions of others and use these abilities to make decisions while interacting with them.	0.712		
25. I recognize my own emotions and feelings and can manage them.	0.695		
26. I encourage my team members to look for "out-of-box solutions" and take risky approaches in challenging work scenarios/situations.	0.638		
31. I ensure the team members are well rewarded for their creative work in our project.	0.643	5.874	48.282
LBSF4: (Mentoring Relationships & Empowerment			
3. I provide support, training & opportunities for my team members to adapt to the new project environment and mentor relationships to grow to perform better.	0.698		
22. I encourage & support my project team to adopt change management when required.	0.698	4.869	53.151
LBSF5: Inspire-Motivation & Visionary)			
1. I inspire and motivate the project team to work together to achieve project goal/s.	0.727		
4. I discuss the big picture and describe what we aspire to achieve as a team.	0.562		
32. I have the flexibility in making decisions	0.691	4.475	57.626
LBSF6: Motivation -Visionary and Promote Relationships			
5. I encourage & motivate team members to achieve more than the agreed project goal/s.	0.550		
9. I encourage team members to solve problems together.	0.647		
12. I encourage team members to share their thoughts/dreams for the future.	0.762	4.351	61.977
LBSF7: Self-Management			
23. I am comfortable & self-confident in receiving feedback and learning from it.	0.824		
27. I keep my negative emotions and feelings in check.	0.781	3.943	65.920
LBSF8: Coaching and Team Empowerment			
15. I suggest ways to improve team performance.	0.717		
19. I always look for new ways to do the job and challenge my project team members to look into how we work.	0.645	3.321	69.241
LBSF9: Promote Relationships			
7. I encourage team members to exchange information with one another.	0.711	3.126	72.367
Rotations converged at 15 iterations.			
CMSF1: Communication Effectiveness			
1. I keep the purpose of communication well-defined & meaningful.	0.680		
2. I communicate clearly, and precisely without any ambiguity.	0.816		

(*Continued*)

Table 3. (Continued).

Extracted Factors	Factor Loading	%Age of Variance Explained	Cumulative %age Variance Explained
3. I understand the communication from others involved in the project.	0.784		
4. I communicate appropriately with different audiences.	0.613		
5. I ensure the information is current, relevant, correct, meaningful, and straightforward.	0.579		
6. I use proper methods/media/channels for communicating the information to project team members and internal/external stakeholders.	0.714		
7. I achieved the expected outcome/s from our communication in general.	0.655		
8. I keep open and honest communication with all project teams and stakeholders.	0.507	38.548	38.548
CMSF2: Relationship Management			
3. I use effective communication/tactics for persuasion.	0.713		
5. I negotiate in resolving disagreements and collaboratively develop a resolution.	0.722		
6. I build and maintain relationships with others, work toward shared goals, and create group synergy in pursuing collective goals.	0.808	10.467	49.014
CMSF3: Conflicts Management			
3. I strive to encourage all parties to communicate willingly.	0.730		
4. I resolve conflict amicably.	0.815		
6. I helped solve relationship issues and problems that emerged on the project.	0.667	8.429	57.444
CMSF4: Communication Willingness			
3 I encourage project team members to share events and changes willingly that may affect the project.	0.788		
4 I follow a trust mechanism in the process of communication.	0.721	6.772	64.216

where none of them might be entered. Using this selection, the data analysis resulted in four key success factors in six iterations. The most dominating key factors identified were in the 6th iteration model, namely, (1) Relationship Management, (2) Self-Management, (3) Leading by Example, and (4) Interpersonal sensitivity and Encouragement (Table 4). All other extracted success factors were excluded during the iteration process because they failed to meet the system's entry/removal-level setup (Probability-of-F value-to-enter ≤ .050, Probability-of-F value-to-remove ≥0.10). A multiple regression analysis was used to test the impact of predictors (key success factors) on project success. Multiple regression analysis indicates the R-squared value of 56.3%; however, the R-squared value cannot be considered to interpret the results as it works in a simple linear regression model. Therefore, the adjusted R-squared value was considered for interpreting the regression results. The adjusted R-squared value of 53.4% (0.534) shows the fitness of the model. A variance of 53.4% in the model summary is explained and accounted for in project success by these four key success factors. The remaining 46.6% variation in the project's success is due to other factors. The identified key success factors positively and statistically significantly impacted project success. The adjusted R-squared value of 0.534 is comparable with similar studies done on success factors by Konchar and Sanvido (1998) on the investigation of project delivery system factors in the USA army with a value of 0.510 and Chan et al. (2001) study on Design and build project success factors with a value of 0.61.

Table 4. Key success factors.

Key Success Factors	Standardized Coefficient (β)	R- Squared	Adjusted *R*- Squared	p-value
Relationship Management	0.375	0.313	0.302	0.000
Self-Management	0.285	0.277	0.215	0.003
Leading by Example	0.251	0.285	0.274	0.011
Interpersonal Sensitivity and Encouragement	0.191	0.188	0.175	0.041

Model Summary						
Mode	R	R Square	Adusted R Square	Std. Error of the Estimate		
1	.750[a]	0.563	0.534	0.27121		
ANOVA[a]		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.781	4	1.445	19.648	<.001[b]
	Residual	4.487	61	0.074		
	Total	10.268	65			

[a]Predictors: (Constant), Communication-Relationship Key Factors, Leadership Key Success Factors
[b]Dependent Variable: Project Success
[c]Predictors: (Constant), Leading by Example, Interpersonal Sensitivity, Self-Management, Relationship Management

The contributing leadership practice attributes to these identified key success factors in the Australian construction sector are given below:

Relationship management

- Use effective communication/tactics for persuasion.
- Negotiate to resolve disagreements and collaboratively develop a resolution.
- Build and maintain relationships with others, work toward shared goals, and create group synergy in pursuing collective goals.

Self-management

- Feel comfortable and self-confident in receiving feedback and learning from it.
- Keep negative emotions and feelings in check.

Leading by example

- Set a good example of behavior (communication and listening skills) with project team and stakeholders.
- Set high standards for performance and adhere to the agreed-upon standards.
- Work hard to achieve the project goals.
- Keep commitments and promises made to the project team members with

Interpersonal sensitivity and encouragement

- Aware of and able to recognize the feelings and emotions of others, using these abilities to make decisions while interacting with them.

- Recognize own emotions and feelings and can manage them.
- Encourage team members to look for "out-of-box solutions" and take risky approaches in challenging work scenarios/situations.
- Ensure the team members are well rewarded for their creative work on the project.

Key success factors explained

The key success factors and their contributing leadership and behavioral practices items are explained below:

- Relationship Management: This factor revolves around solving project issues among stakeholders through skillful communication and persuasive techniques, fostering collaboration to resolve disagreements, and cultivating a harmonious work environment.
- Self-Management: This facet encourages project managers to work on their emotional intelligence, actively seek feedback from their team to enhance themselves, and thereby improve project outcomes.
- Leading by example: It encompasses effective communication and listening skills, establishing high-performance standards, diligent effort toward project objectives, and keeping commitments and promises to build trust, both within and outside the project team network.
- Interpersonal Sensitivity and Encouragement: This factor primarily focuses on recognizing the emotions and sentiments of others, managing one's emotions while interacting with project stakeholders, motivating team members to explore innovative solutions, and acknowledging and rewarding team members for exceptional performance.

(Table 6) compares the leadership styles practiced in different countries. The synthesis of research studies found that the construction industry in most Western countries adopted transformational/transactional leadership practices focusing on relationships, team building, risk-taking, and entrepreneurial behaviors compared to task-oriented, autocratic, and authoritative behaviors in other countries such as Indonesia, Nigeria, and some parts of China. A specific country's socio-cultural and psychological mechanisms and environment often influence leadership behaviors.

Discussion and implications

The primary objective of this study was to investigate the project managers' insights, perspectives, and viewpoints on leadership practices, helping practitioners overcome unique challenges in the construction industry and specific issues faced within the Australian construction sector. Additionally, these identified behaviors and practices were compared with those of their counterparts in a few developed and developing countries' construction industries. Based on the literature review and robust research methodology and analysis, the study revealed four key success factors: Relationship Management, Self-Management, Leading by Example, and Interpersonal Sensitivity and Encouragement and 13 leadership practices, significantly influencing project success and shedding light on behavioral practices prevalent among Australian project managers. Additionally, the

Table 5. Leadership styles/practices for different countries

Country	Leadership Styles/Practices	Context	References
U.K.	1. Important traits identified: Good communication skills Strategic Vision Understanding of Business (Individuals exhibiting high levels of integrity, vision, and communication skills, including charisma and inspiration. These are ranked high in the industry.)	Research was conducted in the U.K. Construction Industry to identify the skill gaps in leadership to improve leadership development.	CIOB, (2008);
	2. Leadership styles for inter-organizational leaders promoting sustainability practices in the U.K. construction industry. Identified leadership styles promoting sustainability: Strategic – Leaders to influence the development of sustainability strategies. Visionary (Transformational and Charismatic) – Leaders create a strategic vision to achieve high levels of cohesion, commitment, trust, and motivation for achieving high-performance outcomes. Charismatic – Leaders are good at shaping the values for others. Transformational – Leaders' influence followers' morals, emotional and cognitive behaviors **Comments**: Strategic leadership style was identified as the most commonly and dominating identified style.	Investigation was performed to identify leaders promoting sustainability in the U.K. Construction Industry	Opoku et al., (2015)
China	1.Leadership styles are more relationship -motivated than their counterparts in the U. K., attributed to cultural differences. 2. Management styles are less task oriented. 3. Transformational and Transactional leadership styles are generally used on construction sites.	Investigation performed on the leadership styles of construction managers in Hong Kong and compared with construction managers' styles from Western cultures.	Rowlinson et al., (1993);
	4. Project managers strongly focus on monitoring and control, adequacy of planning and time management. 5. Combination of Authoritarian, Paternalistic and Cooperating styles **Comments**: In the Chinese construction industry, the socio-cultural examination is relevant to adopted leadership styles in the industry.	Leadership Styles in China investigated based on P-M leadership theory. Northeast China	Fang & Liu, (2014)
USA	1. High task-oriented leadership style identified 2. Less experienced managers were indicated to be more task-oriented than more experienced managers who showed an inclination toward relationship-oriented behaviors. **Comments**:	South Florida A study performed on construction managers in the South Florida construction industry	Panthi et al., (2009);
	1. In general, Western leaders focused on: building teamwork, interpersonal bonds, dignity, and trust. 2. Highly entrepreneurial and risk-taking leaders. 3. Transformational 4. Transactional leadership	Investigation performed on relationships between Construction manager's leadership styles and project success in the U.S. construction industry.	Parson, (2020)

(*Continued*)

Table 5. (Continued).

Country	Leadership Styles/Practices	Context	References
South Africa	1.Democratic, Transformational and Transactional are the leading leadership styles in the construction industry. **Comments**: 1. A culture of acceptance, compassion, and tolerance is prevalent in the construction industry, attributed to South African cultural influence. 2. In addition, leadership participation is mostly shared with the team members rather than invested in one person.	Investigation of construction professionals in the South African construction industry	Emere et al., (2018)
Sweden and Denmark	1.High transformational leadership was found to be a central aspect of safety-promoting leadership style at the construction sites. 2. Passive/avoidant leadership practices were found to be a central aspect of poor leadership at the construction site safety. **Comments**: The transformational leadership behavior was higher among site managers in Sweden than in Denmark, indicating national cultural context- may be due to antecedent to safety leadership in Sweden.	Leadership practice's impact on site safety was studied using mixed methods of investigation for Sweden and Demark construction sites	Grill et al., (2019)
UAE	1.Transformational leadership style is popular at construction sites. 2. Participative or Consultative leadership styles are used frequently by managers to achieve high performance for their organizations – may be due to cultural influence in the construction industry.	Investigation of leadership behaviors in the construction industry	Dubrin, (2004); Youssef, (2000)
Indonesia and Nigeria	Task-oriented style Autocratic Leadership Style	Leadership styles prevalent in the construction industry	Andi et al., 2004); Oke, (2010)

Table 6. Top ranked leadership behavior practices for project managers.

Leadership Behaviour Practices	Item	Mean	SD	Ranking
Work hard to achieve goals	LB14	4.71	0.46	1
Keep commitments & promises	LB16	4.53	0.53	2
Setting a high standard for performance	LB11	4.48	0.56	3
Set a good example of behaviors	LB8	4.32	0.59	4
Build and maintain relationships to work toward shared goals	RM6	4.48	0.53	5
Negotiate to resolve disagreements and create collaborative environment.	RM5	4.24	0.70	6
Comfortable to receive feedback.	LB23	4.21	0.85	7
Recognise own feelings & emotions.	LB25	4.17	0.67	8
Use effective communication for persuasion.	RM3	4.12	0.85	9
Awareness to recognize the feelings of others.	LB24	4.11	0.75	10
Team members are rewarded for their creative work	LB31	4.08	0.75	11
Keep emotions and feelings in check	LB27	3.85	0.81	12
Encourage team to into out of box solutions	LB26	3.71	0.91	13

researchers contextualized the study's findings by comparing them to global construction industry practices.

Exploratory factor analysis identified 13 key components, with high Likert scale scores ranging from 4.3 to 4.7. These scores reflect Australian leaders' strong commitment to exemplary behaviors, empathy, openness to feedback, and fostering team performance. These results align with the (Argyris, 1999) suggestion that managers should embrace self-improvement rather than defending failures. Project managers rated themselves highly in areas such as inspiring and motivating team members (4.4), exchanging information (4.4), showing empathy and compassion (4.4), setting, and adhering to high standards (4.5), working diligently to achieve goals (4.7), and acknowledging team contributions (4.3). These scores highlight transformational, transactional, and authentic leadership practices within the Australian construction industry.

The study used a survey instrument to collect responses on project success, focusing on dimensions such as time, cost, quality, end users' satisfaction, team members' satisfaction, and meeting business objectives (Müller & Turner, 2010). Analysis of project managers' responses, measured on an 11-item Likert scale (1–5), revealed high scores across several indicators. The data was analyzed based on Relative Importance Analysis (means) for project managers' responses, resulting in the following ranked outcomes:

The project managers' scored high on first five out of eleven items in their responses for example, "(1) I was able to achieve project purpose (4.35); (2) I was able to implement safety culture and its protocols/management (safety policies, procedures, and practices) at the project sites (4.32); (3) I am confident that my project has achieved its defined success criteria (4.23); (4) I met the quality needs and requirements of the customers for the project (4.18); (5) I achieved end user's satisfaction with the project outcomes/deliverables (4.15); (6) I was able to achieve the satisfaction of my team members with overall project management and performance (4.11); (7) I completed my project on time as scheduled (4.02); (8) I managed and satisfied all project stakeholders with project deliverables/outcomes (4.01); (9) I completed my project within the allocated budget (3.86); (10) I executed my project in the context of sustainability dimensions (3.86) and (11) I was able to ensure the satisfaction of the suppliers involved in the project (3.85)," showing project professionals impetus on achieving project success through these high scored indicators for the project. The scores mentioned here are in order of rank (1, 2, 3, 4, and so on).

The analysis revealed project managers' significant focus on prioritizing, achieving project purpose, implementing safety protocols, meeting quality standards, ensuring end-user satisfaction, and maintaining team satisfaction in the Australian construction industry. These findings underscore the emphasis placed by project professionals on key performance indicators within their projects. Additionally, a low score on sustainability highlights a need for sustainability awareness among project managers, necessitating efforts to address social, environmental, and economic concerns to minimize resource consumption. To leverage these insights, organizations can implement training initiatives targeting sustainability awareness among project professionals.

The study confirmed that leaders emphasizing people-oriented and relationship-building approaches tend to achieve greater project success through effective communication and collaboration than task-oriented leaders. Two other crucial factors, interpersonal sensitivity, and self-management, encourage project managers to address feedback positively, leading to improved project outcomes. These findings align with research on emotional intelligence and its impact on job success (Goleman, 1998). Additionally, the importance of relationship management in project success, as shown by earlier studies (Davis & Love, 2011; Meng, 2012), was reaffirmed. However, the study performed within the Australian context contrasts its findings on success factors and leadership practices with research from other countries like Singapore, Denmark, Nigeria, and Malaysia (Zhao et al., 2016; Lindhard & Larsen, 2016; Ekung & Ujene, 2014; Yong & Mustaffa, 2013) respectively, attributing differences to unique national construction landscapes. For instance, leadership styles, such as directive and relationship-oriented practices, are preferred for greenfield building projects to achieve productivity in Singapore (Zhao et al., 2016). In contrast, Denmark's study highlighted knowledge sharing and communication as the most critical success factors, among other factors (Lindhard & Larsen, 2016).

Different findings in this research are credited to the project leaders' being more pragmatic in building and maintaining trustful relationships with others in pursuing project objectives. The survey feedback indicated that project managers prioritized relationship management and used relationships to resolve most issues in a project environment. This may be true because of the unique relationship-building work culture in the Australian construction industry. Davis and Walker (2004) have also illustrated how social relationships can help deliver a construction project. Another factor, "leading by example," means a leader's behaviors and commitment to work diligently (setting high standards) for themselves and motivate their team members to work harder to achieve project objectives. These findings are consistent with a study on empowered leadership (Arnold et al., 2000), where exemplary leadership behaviors (communication and listening skills) with the project team and internal and external stakeholders were confirmed to achieve project objectives.

Top-ranked leadership practices

In addition, five top-ranked leadership behavioral practices (Table 6) based on Relative Importance (means) analysis were identified from project managers' responses on the Likert scale (1–5).

Key leadership behavioral practices align with established academic perspectives. "Working hard (diligently) to achieve goals" corresponds to a hard paradigm. Pollack (2007) defined hard paradigms as rigorous and objective, often associated with positivist epistemology. "Setting high standards for performance" resonates with authentic leadership (Toor & Ofori, 2008); leaders challenge followers by exemplifying dedication and commitment, serving as role models for high performance (Gardner & Schermerhorn, 2004). "Setting a good example of behaviors" is fundamental to effective project management (Dainty et al., 2005). The fourth practice, "keeping promises and commitments," fosters trust among project stakeholders, which drives innovation, creativity, openness, and honesty and ultimately contributes to project success. Lastly, relationship management is based on trust and rapport with all the stakeholders, emphasizing open communication, active listening, and support for team members (Cheng & Li, 2004; Davis & Love, 2011; Meng, 2012). Overall, these leadership practices harmonize with existing project management literature, offering valuable insights into enhancing project success and motivating professionals to embrace them to achieve positive outcomes.

The five top-rated leadership practices for project managers demonstrate proficiency in self-awareness, emotional intelligence, exemplifying desirable behaviors, diligent pursuit of shared objectives, fostering trust through consistent commitment, nurturing relationships, self-reflection, and promoting collaborative synergy for enhanced project results. These findings underscore the significance of such leadership behaviors in driving project success within the Australian construction sector. Moreover, project organizations can use these research insights to prioritize leadership strategies to refine project management practices and elevate project performance.

Theoretical and practical contributions

This study carries far-reaching implications for the construction industry, encompassing both sector-specific and overarching challenges. It offers valuable insights into leadership dynamics through empirical research on leadership behavioral practices. The theoretical contribution lies in unraveling project managers' perspectives on the relationship mechanisms between leadership practices and project success, identifying areas where behavioral improvements are needed.

Key success factors and the associated leadership behavioral practices, such as exemplary leadership, effective communication, setting high-performance standards, commitment to project objectives, trust-building through keeping commitments, collaborative teamwork, relationship management, emotional self-management, and motivation of team members, were pinpointed for achieving project success. These findings hold significance for diverse stakeholders in the construction industry, including project professionals, contractors, owners, and educators in construction project management. For instance:

(1) Relationship Management: Innovative practices like stakeholder analysis, communication strategies, conflict resolution, and proactive relationship management can simplify stakeholder engagement complexities and help practitioners establish engagement with different communities to address cultural, social, and environmental impact considerations.

(2) Leading by Example: Implementing safety leadership practices, safety inspections, and reinforcing safety behaviors can enhance safety protocols and regulatory compliance.
(3) Interpersonal Sensitivity and Encouragement: Cultural awareness training and coaching can bridge communication gaps in a diverse, multicultural workforce.
(4) Self-Management: Introducing mindfulness and resilience training programs can equip project leaders with stress management skills and enhance decision-making.

Practically, the study's outcomes can assist project managers in addressing unique sector-specific issues and contribute to addressing broader challenges in the construction industry:

(1) Infrastructure Demands: Effective relationship management and interpersonal sensitivity can navigate complex infrastructure projects by fostering collaboration, managing emotions, and building relationships with various stakeholders and project teams.
(2) Regulatory Compliance Requirements: Leading by example with strong leadership behaviors and communication ensures compliance with strict regulations in the regulated construction industry.
(3) Skill Shortages and Worker Turnover: Effective leadership can attract and retain skilled talent by providing guidance and creating an environment for skill development.
(4) Sustainability: Effective communication facilitates collaboration on sustainable design and methods, integrating sustainability goals into project plans and processes.
(5) Cost Pressures: Effective leadership and communication manage project costs by communicating budgets and fostering cost-conscious cultures.
(6) Technological Advancements: Effective leadership drives the adoption of automation and digital solutions by clearly communicating their benefits to all stakeholders.

In addition to these implications, the study motivates project managers and team members to identify areas for improving communication, enhancing job satisfaction, improving team performance, and promoting a safety culture. It encourages project managers to shift toward relationship-building and people-oriented leadership, adopt innovative practices, and embrace digital technologies for successful projects.

Limitations and conclusion

The study has several limitations that merit consideration in future research. The study focused primarily on project managers' viewpoints regarding leadership behavioral practices in the Australian construction sector. However, future researchers are encouraged to broaden their investigations, encompassing other professionals involved in various project phases, such as design, construction, quality assurance, safety, occupation, operations, project followers and external evaluators. While the study employed a robust methodology to examine project managers' self-perceptions, they may have overestimated their leadership behavioral practices' impact on project success. Including other project professionals and external evaluators in future investigations will be helpful to provide an objective assessment.

Secondly, leadership is dynamic, with its role and practices subject to variation based on project network requirements, circumstances, and external factors. Leadership behaviors evolve over time, suggesting the potential usefulness of longitudinal studies in future research.

Thirdly, given the limited number of valid responses used for analysis, the study's findings are indicative rather than conclusive. Therefore, future researchers should aim for a broader scale, encompassing responses from various international project professionals and stakeholders.

Identifying the essential top five leadership behavioral practices in the study: working diligently to achieve goals, keeping commitments and promises, setting high-performance standards, setting an exemplary behavioral example, and building and nurturing relationships are pivotal and vital for achieving project success. These findings can be a catalyst, encouraging professionals to shift their behavioral practices toward developing interpersonal and people-oriented relationships, adopting collaborative work behaviors for issue resolution, relationship building, concerted efforts toward shared objectives, and synergy in pursuing project goals. Integrating these perspectives into their project management strategies can enable project managers to gain better insight into their strengths and areas for improvement. Consequently, the project managers can invest in developmental programs for themselves and their teams.

Finally, it is recommended that project organizations arrange training programs for project managers, aligning with this study's results. These programs should focus on enhancing leadership strategies and fostering positive behavioral changes. Such initiatives can yield significant benefits for organizations and projects in the construction sector.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Ashok Rehan http://orcid.org/0000-0003-3330-0352

Data availability statement

Research survey data (confidential) is kept with the University of Southern Queensland, Queensland, Australia.

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