BJ O&PM Brazilian Journal of Operations & Production Management

ISSN 2237-8960 (Online)

ABEPRO ASSOCIAÇÃO BRASILEIRA DE ENGENHARIA DE PRODUÇÃO

RESEARCH PAPER

The mediating role of project management practices in the relationship between Project Manager Competencies and perception of project performance

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How to cite: Mensah, L. M. (2025), "The mediating role of project management practices in the relationship between Project Manager Competencies and perception of project performance", *Brazilian Journal of Operations and Production Management*, Vol. 22, No. 4, e20252653. https://doi.org/10.14488/BJOPM.2653.2025

ABSTRACT

Goal: The study, grounded in the social cognitive theory, investigates the impact of project manager competencies on the perception of project performance, with project management practices acting as a mediator.

Design / Methodology / Approach: A descriptive cross-sectional design was employed to collect data from 333 project managers involved in road and housing construction projects in Ghana, using snowball sampling. The data were analyzed using a Covariance-Based structural equation model (CB-SEM), with a focus on confirmatory and path analyses, which yielded significant insights.

Results: It was found that project manager competencies have a positive and significant influence on the perception of project performance and project management practices. Interestingly, project management practices showed a negative influence on the perception of project performance. Moreover, project management practices were found to partially mediate the relationship between project manager competencies and perception of project performance.

Limitations of the investigation: Due to financial constraints, several regions in Ghana were not covered, and the snowball sampling technique was used to recruit participants, limiting the physical accessibility of project managers used in the study.

Practical implications: The study's recommendations for project managers in road and housing construction in Ghana to prioritize competency development, align practices with stakeholder perceptions, strategically implement practices, and continually evaluate and improve hold practical implications.

Originality / Value: This study highlights the mediating influence of project management practices despite current research focusing on direct relationships. The research offers a novel perspective on improving project performance, particularly in developing countries, thereby significantly contributing to the existing body of knowledge.

Keywords: Project manager competencies; Project management practices; Perception of project performance; Project manager.

1 INTRODUCTION

Project management is crucial in road and housing construction projects, where meticulous planning and coordination are necessary for achieving good results (Meredith et al., 2017). Road and housing building projects encompass various participants, complex coordination, and stringent deadlines from the initial planning phase to the ultimate conclusion (Walker, 2015). Efficient project

Financial support: none.
Conflict of interest: The authors have no conflict of interest to declare.
Corresponding author: levimens20@gmail.com
Received: 29 March 2025.
Accepted: 26 January 2026.
Editor: Osvaldo Luiz Gonsalves Quelhas.

management procedures are crucial in coordinating these elements, ensuring optimal allocation of resources, timely implementation, and adherence to quality standards. Project managers in the road and housing construction sector supervise many tasks, including site preparation, procurement of supplies, equipment deployment, and personnel administration (Harris et al., 2021). By employing resilient project management methodologies, road and housing construction projects can effectively reduce risks, proactively tackle challenges, and complete infrastructure projects that fulfil the needs of communities while adhering to budgetary limitations and regulatory obligations (Agenda, 2016).

Project managers are crucial in road and housing construction projects, as they supervise and manage all planning, implementation, and completion (Meredith et al., 2017). Their role involves creating thorough project plans and timetables, efficiently assigning resources, and effectively overseeing stakeholders to ensure the achievement of project objectives. They identify and mitigate risks, ensure adherence to quality standards, and promote effective communication and collaboration among team members and stakeholders (Kerzner, 2017). Effective project managers exhibit robust leadership, technical proficiency, adept communication, problem-solving capabilities, and adaptability. They succeed in road and housing construction projects by efficiently coordinating, leading, and managing project activities (Moradi et al., 2020).

The success of road and housing construction projects relies heavily on the essential qualities of project managers, such as leadership, communication, problem-solving, and decision-making (Gharouni Jafari and Noorzai, 2021). Efficient leadership fosters cooperation and dedication among team members, while concise communication minimizes confusion and improves project understanding. Effective problem-solving skills reduce delays and interruptions while making solid decisions and improve resource allocation and strategy adaptation (Grachev et al., 2021). Ultimately, these skills enable effective project implementation, stakeholder contentment, and project success.

Stakeholders' perception of project performance is not just a measure of success, but a crucial factor that influences their attitudes, decisions, and future interactions with the project or organization (Davis, 2017). Their perspectives on project success can differ based on various criteria, including achieving project objectives, budget and schedule adherence, deliverable quality, stakeholder satisfaction, and alignment with corporate goals (Roeder, 2013). Acknowledging these different viewpoints is crucial to effectively managing stakeholder expectations, ensuring project success, and promoting positive stakeholder relationships.

Ghana's road and housing construction sector faces significant obstacles such as project delays, cost overruns, and subpar quality (Frimpong et al., 2020). These issues hinder the progress of the nation's infrastructure, impacting both economic advancement and the welfare of its inhabitants (Ofori-Kuragu, 2020). The efficacy of project managers in this industry is vital, yet there is an urgent need to address the lack of comprehension regarding their skills and the aspects that impact project success.

By examining the skills and abilities of project managers in Ghana's road and housing industries, this research holds the promise of addressing ongoing difficulties. It aims to uncover crucial areas for enhancement by examining project managers' abilities, methodologies, and perspectives. The discoveries from this study could pave the way for the creation of focused training programs, the enhancement of project management methods, and, ultimately, the improvement of project performance. This, in turn, could significantly advance infrastructure development, enhance efficiency and effectiveness, and ultimately bolster Ghana's economic growth and elevate the standard of living for its inhabitants (Ali et al., 2021).

While the existing literature has extensively explored the relationship between project manager competencies and project performance, a notable gap exists in understanding how project management practices mediate this relationship, particularly in the road and housing construction sectors. Previous studies have underscored the importance of project manager competencies in driving project success, but limited research has specifically examined how project management practices influence this relationship in road and housing construction projects. Therefore, this study aims to fill this gap by investigating the complex interplay between project manager competencies, project management practices, and project performance within the road and housing construction sectors.

Firstly, it examines the impact of project manager competencies on the perception of project performance. This involves understanding how project managers' skills, knowledge, and abilities influence stakeholders' perceptions of project success (Zuo et al., 2018; Irfan et al., 2021). By investigating this relationship, the study seeks to provide insights into the critical competencies driving positive perceptions of project outcomes. Understanding these impacts can help organizations prioritize competency development initiatives to enhance project performance and stakeholder satisfaction.

Secondly, the study seeks to explore the impact of project manager competencies on project management practices. This involves investigating how project managers' competencies influence

the adoption, implementation, and effectiveness of project management practices within organizations (Ahmed and Anantatmula, 2017; Zhang et al., 2020). By identifying the competencies that contribute most significantly to effective project management, the study can inform targeted training and development programs for project managers, ultimately leading to improved project outcomes.

Thirdly, the study aims to examine the impact of project management practices on the perception of project performance. This involves analyzing how implementing various project management practices influences stakeholders' perceptions of project success. By understanding which practices are most closely associated with positive perceptions of project performance, organizations can optimize those practices to meet better project objectives and stakeholder expectations (Kerzner, 2018).

Lastly, the study seeks to explore the mediating role of project management practices on the relationship between project manager competencies and the perception of project performance. This involves investigating the mechanisms through which project management practices act as intermediaries between the competencies of project managers and stakeholders' perceptions of project success. By identifying these mediating pathways, the study can provide insights into how organizations can effectively leverage project management practices to translate the competencies of project managers into positive perceptions of project performance (Kerzner, 2018).

This study provides road and home-building organizations with information about essential skills that have a major impact on how projects are perceived to function favourably. By identifying these crucial competencies, organizations may create focused training and development initiatives for project managers to improve vital skills and capacities that directly impact project success and stakeholder satisfaction. Project managers can utilize the knowledge gained from the study to make well-informed decisions at every stage of the project's lifespan. These activities encompass strategic planning, resource allocation, risk management, and stakeholder engagement. Gaining insight into the influence of competencies and practices on performance perception enables project managers to enhance project outcomes. A deeper understanding of these dynamics enables improved engagement of individuals or groups with vested interests. Project managers can customize their communication and management tactics to align with the preferences and requirements of stakeholders. This tailored approach fosters stronger relationships, increases satisfaction, and contributes to more successful project results.

2 LITERATURE REVIEW

2.1 Theoretical framework

Albert Bandura's Social Cognitive Theory (SCT) offers not just theoretical insights, but also practical applications in project management. It provides a comprehensive understanding of how individuals acquire knowledge, develop competencies, and influence their actions. This theory emphasizes the active interaction between individual characteristics, external variables, and actions, offering a practical framework to comprehend the development and utilization of skills (Schunk and DiBenedetto, 2020). In the context of project management, SCT underscores the significance of observational learning in cultivating project manager skills (Schunk, 2012), making it a valuable tool for project managers in their professional journey.

For novice project managers, the journey begins with a crucial learning method-observational learning. They closely observe and emulate the actions and behaviors of seasoned project managers, gaining valuable knowledge about efficient project management techniques, effective decision-making approaches, and interpersonal abilities (Rolstadås et al., 2014). This learning method is pivotal and transformative in developing leadership, communication, and problem-solving skills for successful project management (Nikitina and Lapiņa, 2019).

At the core of SCT is self-efficacy, which refers to an individual's confidence in completing tasks successfully. This confidence is not a general trait, but it varies with the task at hand. For example, a project manager may feel confident in their ability to lead a team, but less confident in their ability to manage stakeholder interactions. Self-efficacy can be measured using self-report scales or through observation of behavior. A project manager's competencies significantly influence one's beliefs in one's ability to succeed. Project managers who possess a wide range of talents, such as excellent leadership and communication abilities, are more likely to have higher levels of self-efficacy (Caligiuri, 2012). This increased self-confidence enables project managers to navigate challenges confidently, effectively lead teams, and skilfully manage stakeholder interactions.

Moreover, the SCT elucidates how behavioral reinforcement influences the behavior and perceptions of project managers regarding project performance (Riley et al., 2016). When project managers successfully apply their skills and management techniques to achieve positive project outcomes, they are rewarded in various ways. These rewards can be tangible, such as receiving recognition or praise, or intangible, such as a sense of accomplishment or increased self-confidence. This reinforcement strengthens project managers' confidence in their abilities, fostering a more positive perception of project performance.

SCT provides valuable insights into the relationship between project manager competencies and perceptions of project performance. By studying the dynamics of observational learning, self-efficacy, and reinforcement, project managers can enhance their understanding of competency acquisition and its impact on project success (Dissanayake et al., 2019). A comprehensive understanding of this subject equips project managers with the necessary knowledge to enhance their skills, leading to improved project performance and fostering continuous development in project management (Fewings and Henjewele, 2019).

2.2 Hypothesis development

Drawing upon the principles of SCT as the theoretical framework for this study, the following hypotheses were developed to investigate the interplay between project manager competencies and perceptions of project performance mediated by project management practices.

Figure 1 illustrates the study's conceptual framework, mapping the interrelationships among the key variables. Each hypothesized pathway is clearly labeled with its unique identifier, and a legend distinguishes between direct and mediating effects. This diagram offers a concise visualization of the model's architecture and clarifies the nature of the relationships examined for each variable within the research context.

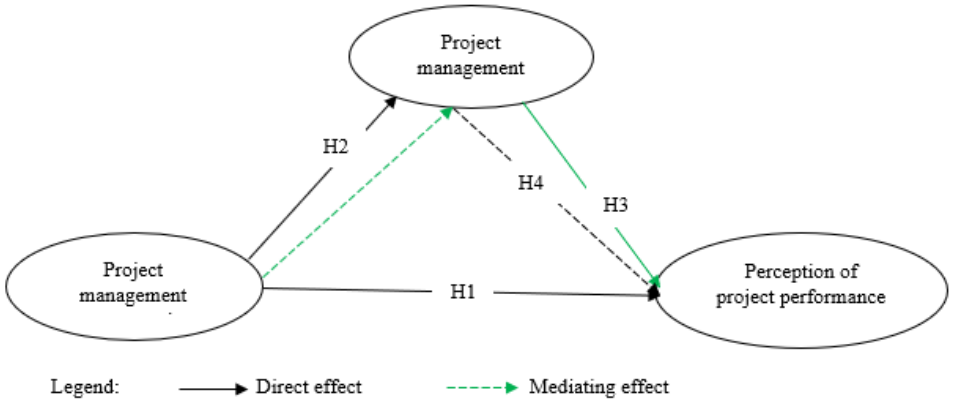

Figure 1 - Research model
Source: Authors' own work.

The influence of project management competencies on the perception of project performance

Project management competencies encompass diverse talents and abilities crucial for achieving favourable project outcomes (Ghorbani, 2023). Emotional intelligence, including self-awareness, self-regulation, empathy, and social skills, plays a pivotal role in project management. Project managers with high emotional intelligence can understand and manage their emotions and those of others, leading to improved interpersonal connections, effective conflict resolution, and enhanced stakeholder engagement (El Khatib et al., 2021). This practical application of emotional intelligence in project management can lead to a more harmonious work environment, better team dynamics, and, ultimately, more successful projects (Rezvani et al., 2016).

Proficient management abilities, such as strategic planning, effective organizing, efficient delegation, and seamless coordination of tasks and resources, are not just essential but strategic for project success (Awan et al., 2015). Project managers with robust management skills can create comprehensive project plans, optimize resource allocation, and monitor progress effectively. Their adept management of project activities and stakeholders enhances project coordination and control, resulting in a favorable evaluation of project performance (Blak Bernat et al., 2023).

Cognitive faculties, including critical thinking, problem-solving, decision-making, and analytical

skills, are crucial for addressing complex challenges and making informed judgments throughout a project's lifecycle (Dwyer et al., 2014). Project managers with strong cognitive abilities can identify problems, evaluate various options, and implement solutions efficiently, improving project outcomes and stakeholder satisfaction. Their ability to analyze data, anticipate potential risks, and adapt to changing conditions positively influences their assessment of project effectiveness (Pavez et al., 2021). This underscores the critical role of cognitive abilities in project management, particularly in navigating complex and unpredictable situations.

Sunindijo (2015) conducted an empirical study to identify skill components affecting construction project time, cost, and quality performance. The study surveyed 107 project managers in the construction industry and employed correlation and regression analyses. The findings revealed that interpersonal influence positively affected project time performance. Emotional intelligence, interpersonal skills, apparent sincerity, and budgeting influenced project cost performance. Project quality performance was linked to visioning, emotional intelligence, interpersonal skills, transformational leadership, interpersonal influence, apparent sincerity, quality management, and document and contract administration. These findings provide tangible evidence of the impact of various skills and competencies on project performance, reinforcing the importance of these factors in project management.

Masood et al. (2018) investigated the relationship between project manager personality traits and project success, focusing on timely project completion. The study utilized an explanatory approach, formulating hypotheses deductively following a literature review. Data were collected quantitatively using a questionnaire adapted from John, Donahue, and Kentle (1991) from 85 Certified Project Managers of the Project Management Institute (PMI). The study considered five personality traits—openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism—independent variables. Hypotheses were tested using the chi-square test of association. Results showed significant associations between extraversion, neuroticism, and openness to experience with project success regarding timely completion. However, no significant relationships were found between agreeableness, conscientiousness, and project success.

Sang et al. (2018) assessed project manager competency for green construction, given its crucial role in project success, particularly in green building construction (GBC). Through a literature review, focus group meetings, and a questionnaire survey, they identified critical success factors for green buildings and project manager competency. The study used structural equation modelling to test hypotheses, revealing the importance of leadership, organization, target management, and emotional intelligence for green construction performance in China.

Fareed et al. (2021) conducted a study to explore the impact of project managers' emotional and intellectual competencies on project success within the public sector of Pakistan. The research aimed to determine the effect of emotional intelligence (EQ) and intellectual intelligence (IQ) on project managers' performance. Data were collected through a survey involving 382 project managers, team members, and stakeholders. The study analyzed the relationship between EQ, IQ, and project success, focusing on their combined effect on project outcomes. Results indicated that combining IQ and EQ significantly contributes to project success in Pakistan's public sector.

Zhang and Hao (2022) explored how a construction project manager's (CPM's) emotional intelligence (EI) affects project success, particularly in the context of China's construction market. Using in-depth interviews with 24 CPMs with over 5 years of experience, the study employed grounded theory methodology to analyze data. Findings revealed a multilevel mechanism where CPM's EI influences project success through team-level factors like positive team atmosphere and individual-level factors such as organizational citizenship behavior and trust in the leader. The study highlighted that this mechanism evolves rather than having an immediate impact.

H1: Project management competencies significantly influence the perception of project performance.

The influence of project management competencies on the project management practices

Project managers who harness the power of emotional intelligence are empowered to effectively interact with stakeholders, understand their requirements and concerns, and cultivate positive relationships, cooperation, and continuous engagement throughout the project (Boyatzis et al., 2019). These skills not only enable project managers to encourage and motivate team members, fostering a supportive team atmosphere, but also empower them to adeptly manage conflicts, ensuring productive resolution and enhancing team unity and effectiveness (Masuda and Kostopoulos, 2016).

Project managers who possess strong management skills are able to carefully craft project plans, allocate resources effectively, and establish precise targets and milestones. This meticulous

approach ensures clarity, direction, and optimal resource utilization for the project (Hartley, 2020), instilling a sense of confidence and focus. Management skills also empower project managers to efficiently identify, evaluate, and mitigate risks, reducing disruptions and strengthening project resilience. Moreover, adept job prioritization, effective deadline management, and efficient resource allocation ensure continuous project progress and timely completion (Vanhoucke, 2012).

Furthermore, project managers with strong cognitive abilities examine complex issues, assess various options, and execute efficient resolutions. This process involves gathering and analyzing data, considering different perspectives, and making informed decisions. Their well-informed decisions, based on comprehensive data analysis and risk assessment, ensure alignment with project objectives and contribute to project success. Project managers with cognitive skills can effectively respond to evolving project requirements, stakeholder demands, and external influences. They can flexibly adjust project plans and tactics to maximize project outcomes, ensuring adaptability and success. This cognitive decision-making process is a key aspect of project management and can greatly influence project outcomes (Walker, 2015).

Liu et al. (2020) examined how project management practices (PMPs) affect the sustainable success of infrastructure projects managed by Chinese entities, both domestically and abroad. This research is particularly relevant to project managers in the infrastructure sector, as it provides insights into the factors that contribute to project success. The study involved a comprehensive survey of 162 projects, which were then analyzed using structural equation modelling (SEM) based on goal-setting theory. The findings indicate that culture and reflection directly impact the motivation of project management professionals (PMPs) to pursue infrastructure projects. Additionally, culture indirectly affects ISS through its influence on strategy, implementation, and reflection. The strategy has an indirect impact on ISS through its execution and reflection. Similarly, the implementation of strategy indirectly influences ISS through reflection. The results underscore the crucial contribution of PMPs, specifically culture and reflection, to achieving sustainable success in infrastructure projects.

Xue et al. (2020) adopt an innovative approach to examine the impact of project supervisory soft skills on project sustainability. Soft skills, also known as interpersonal skills, are personal attributes that enable someone to interact effectively and harmoniously with others. In the context of project management, these skills include communication, leadership, teamwork, and problem-solving. Their study aims to identify competence gaps among project managers regarding sustainability and provide guidance on addressing them. Analyzing data from 242 respondents in software houses, the research utilizes structural equation modelling in PLS-SEM to explore relationships. Results show a positive influence of project manager soft skills on project sustainability, with innovation mediating this relationship. The findings underscore the importance of project managers' soft skills in fostering innovation and ensuring project sustainability.

H2: Project management competencies significantly influences project management practices

The influence of project management practices on perception of project performance

Adhering to efficient project management methods enhances the achievement of project deliverables according to specified requirements and standards (Kerzner, 2018). This not only meets the expectations of those involved but also positively influences their perception of the project's performance (Di Maddaloni and Derakhshan, 2019). Furthermore, implementing these strategies facilitates project timelines and schedule adherence, leading to projects being completed on time or ahead of schedule, which are typically deemed successful (Merrow, 2011).

Additionally, implementing project management strategies prioritizing budget planning, monitoring, and control helps adhere to the allocated budget (Burke, 2013). Projects completed without significant cost overruns are often viewed as well-managed and successful. Adopting effective communication methods ensures stakeholders are well-informed and actively engaged at every project stage. Open and transparent communication about a project's progress, challenges, and achievements positively impacts stakeholders' perceptions of its performance (Jitpaiboon et al., 2019).

Furthermore, implementing proactive risk management strategies assists in identifying, evaluating, and mitigating potential hazards throughout the project lifecycle (Muriana and Vizzini, 2017). Stakeholders have a more positive perception of projects that effectively manage risks, demonstrating their ability to navigate challenges and adapt. Promoting collaboration and teamwork among project members fosters a favorable working environment and enhances overall project effectiveness (Nauman et al., 2022). Stakeholders view projects more positively when they observe strong team dynamics and collaboration. Moreover, implementing agile project management approaches enables projects to adapt efficiently to evolving requirements and priorities. Stakeholders perceive projects that demonstrate adaptability and flexibility in response to changing conditions as more effective (Olsson, 2006).

The study by Ling et al. (2009) on project management practices of Singaporean architectural, engineering, and construction (AEC) firms in China yielded significant findings. The research, conducted through a structured questionnaire distributed via postal and email surveys, underscored the crucial role of scope management practices in shaping project performance. Specifically, the control of contract document quality and the management of contract changes emerged as influential factors.

Unegbu et al. (2022) conducted a comprehensive study on the Nigerian construction industry, exploring the relationship between project performance measures and project management practices. The research, which involved data collection from 221 respondents, including contractors, clients, and consultants from ten construction companies, revealed significant correlations. The findings highlighted the link between customer satisfaction, project performance, stakeholder management, and project success, thereby emphasizing the importance of effective project management practices.

H3: Project management practices significantly influences perception of project performance.

The mediating role of project management practices on the relationship between project management competencies and perception of project performance

Project management practices are crucial for translating project management skills into measurable results, thereby influencing the overall evaluation of project success (Kerzner, 2018). But beyond these skills, effective project leadership requires a special set of characteristics, including emotional, management, and cognitive skills. Emotional intelligence, in particular, is a key component. It enables project managers to cultivate positive relationships and establish a nurturing team atmosphere. By exhibiting empathy, self-awareness, and resilience, project managers can effectively manage interpersonal dynamics, inspire trust, and foster collaboration among team members (Pirozzi, 2020). Their emotional intelligence allows them to handle obstacles calmly and empathetically, ensuring successful project completion even in challenging circumstances.

Management competency is essential for successful project planning, organization, and execution (Takey and de Carvalho, 2015). Project managers have a crucial role in establishing a culture of accountability and success within the project team. They have expertise in strategic planning, resource allocation, and team coordination, enabling them to establish precise project objectives, adhere to timeframes, and optimize resource utilization. Their ability to assign responsibilities, inspire team members, and provide guidance cultivate this culture (Fapohunda, 2013). Project leaders must also possess cognitive acumen to make well-informed decisions, solve intricate challenges, and propel strategic initiatives. Those with strong critical thinking skills, analytical abilities, and decisiveness can effectively recognize risks, predict issues, and develop creative solutions to overcome hurdles (Merrow and Nandurdikar, 2018). Their capacity to integrate information, prioritize activities, and adapt to evolving conditions empowers them to guide projects towards success in the face of uncertainty and ambiguity.

Project management practices provide the operational structure for converting these skills into practical strategies and processes (Almashhadani and Almashhadani, 2023). Project managers utilize various methods, including scope management, schedule adherence, cost control, and quality assurance, to ensure project success. For instance, by implementing quality management standards, a project manager can ensure that the final product meets or exceeds the expectations of the stakeholders. By developing strong risk mitigation measures, engaging stakeholders, and implementing quality management standards, project leaders ensure project goals are met and overall performance is improved (Weng, 2023). Utilizing emotional, management, and cognitive abilities in project management procedures enhances key performance indicators such as meeting deadlines, adhering to budgets, maintaining quality standards, and ensuring stakeholder satisfaction. Consistently achieving positive results and cultivating positive relationships with stakeholders help projects establish a reputation for exceptional performance, strengthening positive impressions of the project within the stakeholder community (Ika and Donnelly, 2017).

H4: Project management practices significantly mediate the relationship between project manager competencies and perceptions of project performance.

3 METHODOLOGY

3.1 Research design

The study employed a descriptive cross-sectional method, facilitating simultaneous and efficient participant data collection (Taylor et al., 2017). This approach afforded us a comprehensive over-

view and enabled the exploration of relationships across various projects or organizations. Its clarity and efficiency provided a robust framework for navigating the complexities inherent in our topic of inquiry.

3.2 The target population

The study population consisted of project managers overseeing road and housing construction projects in Ghana. The utilization of project managers from the road and housing sectors in Ghana is due to their crucial role in tackling the issues faced by the industry. Infrastructure development, namely in roads and housing, is vital in promoting Ghana's economic growth and social advancement (Owusu-Manu et al., 2019). Nevertheless, the industry encounters numerous obstacles, including project delays, exceeding budgeted costs, and concerns regarding product quality. The study, with its aim to uncover and address the underlying causes of these issues, holds the promise of improving the project managers' work environment and outcomes. By explicitly targeting project managers, who have direct responsibility for overseeing and implementing these projects, the findings will offer a valuable understanding of the skills, methods, and perspectives of project managers, allowing for specific actions to enhance project execution and results in the road and housing sectors of Ghana (Kwofie et al., 2016).

3.3 Sample size

Given the unknown population size of project managers in Ghana's housing and road construction sectors, we employed the Cochran method to calculate the sample size. The Cochran formula is expressed as:

$$n = \frac{Z^2}{4e^2}$$

"n" is the required sample size,
"Z" is the Z-score corresponding to the desired confidence level,
"e" is the desired margin of error.

$$n = \frac{1.96^2}{4(0.05)^2}$$
$$n = \frac{3.8416}{0.01}$$
$$n = 384$$

Data collection spanned six months, commencing in August 2023 and concluding in January 2024. Out of the total sample size of 384, 333 valid questionnaires were retrieved. The response rate was calculated as:

$$Response\ Rate = \frac{Total\ Sample\ Size}{Number\ of\ Valid\ Questionnaire} \times 100\%$$

$$Response\ Rate = \frac{333}{384} \times 100\%$$
$$Response\ Rate = 86.7\ \%$$

3.4 Sampling Technique

Both printed and electronic questionnaires were utilized, aligning with the snowball sampling technique employed in the study. Snowball sampling, a collaborative approach, involves initial participants referring or introducing the researcher to additional potential participants, creating a network that expands over time (Geddes et al., 2018). This method fits our topic as it allowed us to tap into the interconnected network of project managers in the road and housing construction sector, leveraging existing relationships and networks. Initially, selected project managers were provided with printed questionnaires, and they, in turn, were encouraged to share the electronic questionnaire, facilitated through a Google Form, with their peers and colleagues within the industry. This approach facilitated broader participation and ensured representation across various segments of the project management community in road and housing construction projects in Ghana.

Snowball sampling can introduce biases when employed to gather data from project managers in Ghana's road and housing sectors. Participants often recommend others similar to themselves,

leading to a non-representative sample and selection bias. Furthermore, it can disproportionately represent certain groups while inadequately representing others, potentially leading to biased results and limited applicability. However, despite these limitations, snowball sampling remains a valuable tool for reaching individuals who face barriers to access, empowering them to share their unique insights and experiences.

3.5 Measurement

The questionnaire utilized in this study was compiled from three distinct sources, all of which have direct relevance to the Ghanaian project management context. Firstly, the questionnaire concerning project manager competencies was adapted from De-Rezende and Blackwell (2019). This questionnaire encompassed three sub-categories: emotional skills, management skills, and cognitive skills, comprising six, five, and eight questions, respectively. Emotional skills play a critical role in effectively handling interactions with various stakeholders and upholding team morale, which is essential in the multicultural setting of Ghana. Proficiency in management is essential for effectively strategizing, coordinating, and supervising projects, guaranteeing punctual and economical completion in an industry that places great emphasis on infrastructure advancement. Project managers in Ghana rely on cognitive abilities to effectively address intricate problems, engage in critical thinking, and make well-informed judgments. These skills are crucial for successfully managing building projects' technical and logistical complexities.

Secondly, the questionnaire regarding project management practices was sourced from Tereso et al. (2019). Although the original questionnaire contained 20 questions, only seven were deemed applicable to Ghana's road and housing construction managers. Efficient project management procedures, encompassing tasks such as planning, scheduling, budgeting, and risk management, are essential to guaranteeing that projects are finished promptly, within the allocated budget, and with the necessary quality standards. In Ghana, it is crucial to prioritize these practices due to the emphasis on infrastructure development. Projects in this country frequently encounter difficulties such as limited resources, regulatory obstacles, and logistical complications. Project managers can effectively navigate these hurdles and attain successful project outcomes using recognized project management practices.

Lastly, the questionnaire on perceptions of project performance was obtained from Nguyen and Watanabe (2017). It consisted of five questions, all of which were utilized. Perception of project performance offers valuable information on how projects achieve their goals regarding timeliness, cost-effectiveness, quality, and stakeholder contentment. This metric is particularly significant in Ghana because infrastructure projects are vital for the nation's progress and are frequently subject to examination by many stakeholders, such as government entities, communities, and investors. By comprehending the perspective of project performance, project managers can pinpoint areas for enhancement, refine their methods, and guarantee better congruity with stakeholder expectations and project objectives.

The rating scale, a five-point Likert scale ranging from 'never' to 'always', was used to design the questions on project manager competencies and practices. This scale, with its balanced response options, was a key element in our research. A Likert scale ranging from 'not at all' to' very satisfied' was used to measure the perception of project performance. This scale, with its clear and distinct response options, facilitated efficient and effective responses from project managers. It played a crucial role in ensuring a comprehensive assessment of their perspectives on the topics addressed in the questionnaire, thereby enriching the depth of our research.

3.6 Method of data analysis

Confirmatory Factor Analysis (CFA) and Covariance-Based Structural Equation Modelling (CB-SEM) were employed using Amos software and SPSS to analyze the data in this study. CFA was utilized to assess the validity and reliability of the questionnaires (Prudon, 2015), ensuring that the chosen measures accurately represented the underlying constructs of project management competencies, practices, and performance perceptions.

Following this, CB-SEM was employed in a comprehensive manner to explore the direct and indirect relationships between the variables under investigation. This thorough analysis allowed for the evaluation of how project management practices mediate the relationship between project management competencies and project performance perceptions. Decisions regarding the acceptance or rejection of hypotheses were made based on the results derived from SEM, providing detailed insights into the complex interplay between the variables studied.

4 RESULTS AND DISCUSSIONS

Table 1 presents the socio-demographic characteristics of the project managers in Ghana. According to the data, the sample mainly comprises males, with 75.98% males and 24.02% females. Regarding educational credentials, 42.64% of the participants possess a diploma, 36.94% have obtained a bachelor's degree, 13.51% have a master's degree, 6.01% possess a professional certificate, and 0.90% have achieved a PhD. The age distribution reveals that 36.94% of the participants fall within the age range of 26–35 years, 31.23% are aged 36–45 years, 12.91% are aged 18–25 years, 13.51% are aged 46–55 years, and 5.41% are aged 56 years and above. The distribution of specializations is as follows: 39.64% of individuals specialize in civil engineering, 16.52% in construction management, 18.92% in quantity surveying, 11.41% in environmental engineering, 3.60% in health and safety management, and 9.91% in contract management. Regarding years of professional experience, 48.95% of the participants reported having worked for 11–15 years, 26.73% for 1–10 years, 13.51% for 16–20 years, and 10.81% for 21 years and beyond. Generally, the sample primarily comprises male individuals who possess a diploma. Most of these individuals fall within the age range of 26–35 years and specialize in civil engineering. Additionally, they have accumulated 11–15 years of professional experience.

Table 1 - Socio-demographics of project managers in Ghana

		n	Percentages (%)
Gender	Females	80	24.02
	Males	253	75.98
Educational qualification	Diploma	142	42.64
	Bachelor degree	123	36.94
	Master degree	45	13.51
	Professional certificate	20	6.01
	PhD	3	0.90
Age Distribution	18 -25 years	43	12.91
	26- 35 years	123	36.94
	36- 45 years	104	31.23
	46-55 years	45	13.51
	56 years above	18	5.41
Specialization	Civil Engineering	132	39.64
	Construction Management	55	16.52
	Quantity Surveying	63	18.92
	Environmental Engineering:	38	11.41
	Health and Safety Management	12	3.60
	Contract Management	33	9.91
Years of working	1-10 years	89	26.73
	11-15 years	163	48.95
	16-20 years	45	13.51
	21 years and above	36	10.81

Table 2 presents the descriptive statistics of the variables used in the study. The mean for project manager competencies is 3.501, indicating that, on average, the project managers are perceived to possess moderately high competencies. This suggests that the project managers exhibit satisfactory skills, knowledge, and abilities required for effective project management (Schwalbe, 2009). The mean for project management practices is 3.514, suggesting that, on average, project managers perceive to engage in moderately effective practices. This indicates that while there is room for improvement, project managers are generally viewed as employing suitable techniques and methods in managing projects. Regarding the perception of project performance, the mean is 4.487, indicating that, on average, project managers perceive project performance to be relatively high. This suggests a positive perception of projects' overall success and effectiveness within the sampled population.

The study employed matrix correlation analysis to assess whether the independent variables exhibit perfect correlation. The results indicate that the relationship between project manager practices and perceptions of project performance is not perfectly correlated. This conclusion is drawn from the coefficient values obtained through matrix correlations, which do not surpass the threshold of 0.70 (Arhinful et al., 2023). This threshold is commonly used in statistical analysis to determine the strength of a correlation, with values above 0.70 indicating a strong correlation. Therefore, based on the analysis, there is no perfect correlation between project manager practices and perceptions of project performance.

Table 2 - Descriptive Statistics and matrix correlation

	N	Mean	Std. Deviation	1	2	3
(1) Project manager competencies	333	3.501	.693	1		
(2) Project manager practices	333	3.514	.723	.657**	1	
(3) Perception of project performance	333	4.487	.488	.052	.090	1

*** p<.01, ** p<.05, * p<.1

Table 3 showcases the pivotal role of the methods used to assess the model's fitness in the confirmatory factor analysis. This assessment is a cornerstone of statistical analysis, as it not only determines the model's adequacy in representing the underlying data but also its ability to make accurate predictions (Tedeschi, 2006). In this study, we have employed seven robust methods to thoroughly evaluate the model's fitness.

The initial step in evaluating the model fitness involved calculating the CMIN/DF ratio, which compares the observed and predicted covariance matrices against the degrees of freedom. The obtained CMIN/DF estimate of 3.195, falling within the acceptable range of 3 to 5 (Danish et al., 2015; Günal et al., 2020), provides strong evidence of a satisfactory model fit. Subsequently, the Comparative Fit Index (CFI) was utilized to gauge the improvement in model fit relative to a null model. The resulting CFI estimate of 0.902, surpassing the recommended threshold of 0.90 (Ma et al., 2022; Zhong et al., 2022), further strengthens the robustness of the model's fit to the data.

Similarly, the Goodness-of-Fit Index (GFI) was employed to assess the extent to which the model accounts for the observed data variance. The model demonstrates a favourable fit with a GFI estimate of 0.914, exceeding the threshold of 0.90 (Ma et al., 2022; Zhong et al., 2022). The Tucker-Lewis Index (TLI), or Non-Normed Fit Index (NNFI), was then applied to assess the enhancement in model fit compared to a null model. The TLI estimate of 0.911 surpassed the recommended threshold of 0.90 (Ma et al., 2022; Zhong et al., 2022), affirming the adequacy of the model's fit.

Furthermore, the Adjusted Goodness-of-Fit Index (AGFI) was calculated to adjust the GFI for the model's degrees of freedom. The AGFI estimate of 0.821, meeting the criterion of being greater than 0.80 (Ainur et al., 2017), suggests an acceptable model fit. To evaluate the average standardized discrepancy between the observed and predicted covariance matrices, the Standardized Root Mean Square Residual (SRMR) was utilized. The model demonstrates a commendable fit with an SRMR estimate of 0.01, below the threshold of 0.08 (Feng et al., 2017).

Finally, the Root Mean Square Error of Approximation (RMSEA) was employed to evaluate the discrepancy between the observed and predicted covariance matrices per degree of freedom. The RMSEA estimate of 0.02, falling below the recommended threshold of 0.08 (Feng et al., 2017), indicates a favourable fit for the model. Collectively, these analyses reaffirm the proposed model's suitability in capturing the relationships among the variables under investigation, bolstering confidence in the validity of the study's findings.

Table 3 - Model fitness assessment

Model fitness indices	CMIN/DF	CFI	GFI	TLI	AGFI	SRMR	RMSEA
Estimate	3.195	0.902	0.914	0.911	0.821	0.01	0.02
Threshold	3 -5	> 0.90	> 0.90	> 0.90	> 0.80	< 0.08	< 0.08

Table 4 provides the results of the discriminant validity, normality, and reliability assessments conducted for the study variables, which are depicted in Figure 1.

A. Discriminant validity

Three statistical methods, individual standardized loadings, average variance extracted (AVE), and maximum shared variance (MSV), were employed to assess the convergent validity of the study's constructs (dimensions). These methods are widely used in research methodology to ensure that each construct measures a distinct aspect of the phenomenon under study (Rönkkö and Cho, 2022).

According to established criteria, standardized loadings should ideally exceed 0.50 (Cheung et al., 2023), indicating a strong relationship between the items and their respective constructs. Similarly, the AVE, representing the average variance captured by the construct's indicators, should exceed 0.50 (Hair et al., 2021). The MSV, which indicates the variance shared between constructs, should ideally be lower than the AVE (Hair et al., 2021).

Upon thorough review, it is evident that the standardized loadings for all items within the constructs of project manager competencies, project manager practices, and perception of project performance have surpassed the 0.50 threshold. This robust relationship between the items and their respective constructs instils confidence in the validity of our findings. Additionally, the AVE values for each construct, exceeding 0.50, indicate a substantial amount of variance captured by the construct's indicators. Lastly, the MSV values, lower than the corresponding AVE values for each construct, confirm that the constructs share less variance than their respective indicators. These convergent validity assessment results underscore the distinctness of the study's constructs, meeting the established criteria for standardized loadings, AVE, and MSV.

B. Normal distribution of the datasets

The skewness and kurtosis values were analyzed to assess the symmetry and peakedness of the distributions for variables related to project manager competencies, practices, and perceptions of project performance. Negative skewness values indicate left-skewed distributions, while positive values signify right-skewed distributions (Watthanacheewakul, 2021). Kurtosis values greater than zero suggest more peaked distributions than the normal distribution.

Negative skewness predominated for project manager competencies and practices, indicating slight left-skewed distributions. Kurtosis values were generally within the accepted range of -3 to +3, suggesting distributions close to normality. Similarly, the perception of project performance exhibited predominantly negative skewness, indicating left-skewed distributions, with kurtosis values generally within the accepted range, indicating distributions close to normal.

The results of the skewness and kurtosis analysis provide reassurance about the normality of the datasets. While some items show no deviations from normality, the skewness and kurtosis values fall within the accepted ranges, indicating that the data approximates a normal distribution. This adherence to normality is crucial for robust statistical analyses, further enhancing the quality and reliability of our data.

3 RELIABILITY

The reliability of the dataset was assessed through two key measures: Cronbach's alpha and composite reliability. Cronbach's alpha gauges the internal consistency of items within a construct (Nordin et al., 2017), while composite reliability evaluates the overall reliability of the construct, accounting for shared variance and measurement error (Hair et al., 2020). Assessing reliability ensures that the items consistently measure the intended concept, enhancing the accuracy of the observed scores. Both measures provide valuable insights into the dataset's reliability, indicating the extent to which the observed scores accurately reflect the valid scores of the constructs.

This study calculated both Cronbach's alpha and composite reliability for each construct. The criteria for acceptable reliability are that both Cronbach's alpha and composite reliability should exceed 0.70 (Sujati and Akhyar, 2020; Yusoff et al., 2020). For project manager competencies, Cronbach's alpha value was 0.969, and the composite reliability was 0.959, indicating high internal consistency and reliability. Similarly, for project manager practices, both Cronbach's alpha (0.924) and composite reliability (0.923) surpassed the threshold of 0.70, suggesting good reliability. Finally, for the perception of project performance, both Cronbach's alpha (0.848) and composite reliability (0.844) met the criterion for acceptable reliability.

These results demonstrate that the dataset exhibits strong internal consistency and reliability. This is crucial as it ensures that the constructs are accurately measured, which in turn provides confidence in the validity of the findings. The high reliability of the dataset enhances the accuracy of the observed scores, thereby increasing the validity of the study's conclusions.

Table 4 - Convergent validity, Reliability and Normality

Construct (dimension)	Item	Standardized loadings	Skewness	Kurtosis	CR	CA	AVE	MSV
Project manager competencies	EMS1	.732	-1.171	1.294	.969	,959	.623	.346
	EMS2	.787	-1.126	1.218				
	EMS3	.808	-1.122	1.144				
	EMS4	.831	-.898	.784				
	EMS5	.760	-.884	.343				
	EMS6	.763	-.950	.629				
	COS1	.691	-1.204	1.562				
	COS2	.824	-.553	.057				
	COS3	.828	-.662	.467				
	COS4	.837	-.911	.808				
	COS5	.884	-.845	.861				
	COS6	.848	-.971	.987				
	COS7	.656	-.639	-.222				
	COS8	.714	-.774	.130				
	MGS1	.803	-1.313	1.651				
	MGS2	.832	-1.177	1.486				
	MGS3	.820	-1.105	.901				
	MGS4	.751	-.970	.732				
	MGS5	.788	-.837	.400				
Project management practices	PPP1	.788	-.940	.210	.924	.923	.634	.361
	PPP2	.785	-.878	.488				
	PPP3	.826	-1.141	1.121				
	PPP4	.831	-1.175	1.344				
	PPP5	.746	-1.203	1.742				
	PPP6	.807	-1.195	2.053				
	PPP7	.788	-1.278	1.881				
Perception of project performance	PPM1	.641	-1.452	2.905	.848	.844	.529	.239
	PPM2	.774	-1.239	2.356				
	PPM3	.755	-.935	1.057				
	PPM4	.713	-1.212	1.926				
	PPM5	.746	-.818	.773				

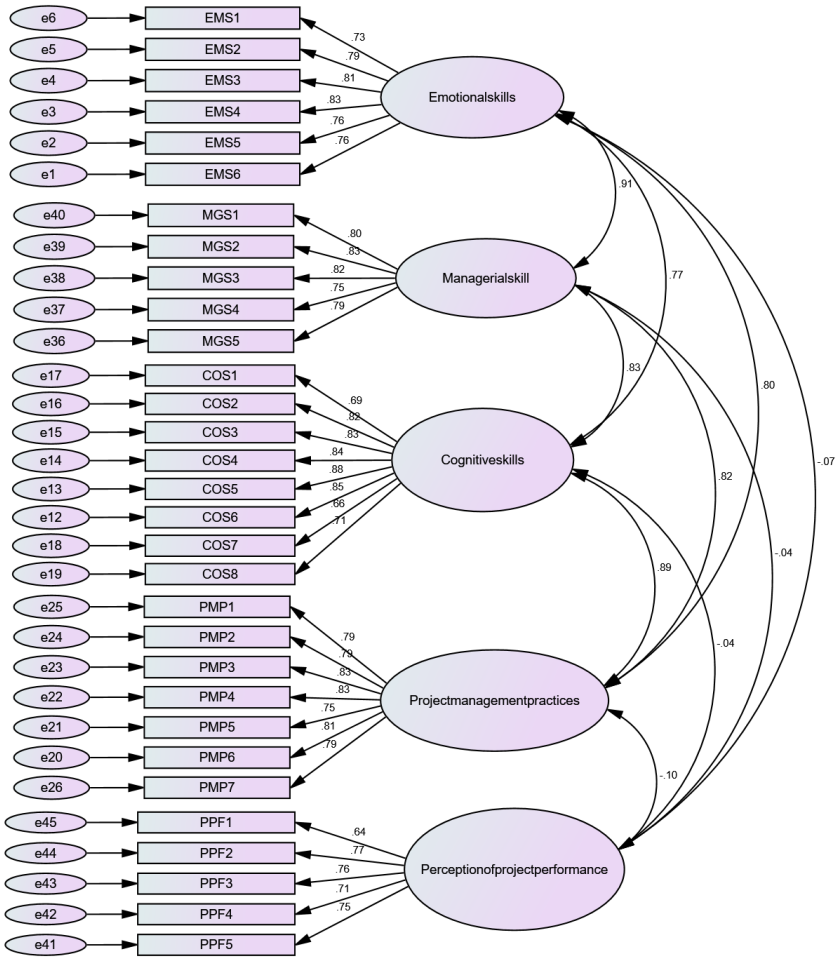

Figure 1 - Standardized loadings

Table 5 visually represents discriminant validity, a key concept in our research. It ensures that different measures of the exact construct correlate effectively. We apply the Fornell-Larcker criterion, which compares the square root of the AVE with inter-construct correlations. This criterion is instrumental in establishing discriminant validity, as it sets the standard that each construct's square root of the AVE should exceed correlations with other constructs (Ab Hamid et al., 2017).

Our analysis reveals a clear pattern: the square root of the AVE for each construct consistently outperforms correlations with other constructs. For instance, in the project manager competencies, the AVE square root value (0.789) significantly surpasses correlations with project management practices (0.657) and perception of project performance (0.052). Similarly, for project management practices, the AVE square root value of (0.797) notably exceeds the correlation value of perception of project performance 0f (0.090). These results underscore the strength of the construct's measures, confirming discriminant validity and indicating that each construct's measures share more variance within their construct than others.

Table 5 - Discriminant Validity

	PMC	PMP	PPP
Project manager competencies	.789		
Project management practices	.657	.796	
Perception of project performance	.052	.090	.727

Table 6, a key component of our study, provides crucial insights into the direct effect relationship as determined by our path analysis. These results were pivotal in assessing the acceptance or rejection of the proposed hypotheses, underscoring the significance of our research. The results

for the unstandardized coefficients are presented in Figure 2, further emphasizing the depth of our findings.

Our findings reveal a promising trend: project manager competencies (B = 0.115, t = 8.214, p < 0.01) demonstrated a significant and positive influence on the perception of project performance. This suggests that by enhancing these competencies, project managers can improve project performance significantly, offering a ray of optimism for project management.

Second, project manager competencies (B = 1.022, t = 12.994, p < 0.01) had a positive and significant influence on project management practices.

Lastly, project management practices (B = -0.146, t = -4.857, p < 0.01) displayed a negative and significant influence on the perception of project performance. Our research underscores the importance of project management practices in shaping the perception of project performance. This finding empowers project managers and professionals in the field to reassess and potentially modify their practices, potentially positively impacting project performance perception.

The R-square (R^2) values indicate the proportion of variance in the dependent variables that the model's independent variables can explain. For the perception of project performance, the R-square value of 0.820 indicates that the independent variables included in the model can explain approximately 82% of the variance in project management practices. This suggests that the project manager's competencies and practices accounted for a substantial portion of the variability in perceived project performance.

Similarly, for project management practices, the R-square value of 0.151 indicates that the independent variables included in the model can explain around 15.1% of the variance in these practices. This implies that factors related to project manager competencies and perceptions of project performance contribute significantly to the variability in project management practices.

Table 6 - Direct effect relationship

Relationships	Hypothesis	B	Std. Error	t	Beta	Sig.	Decision
PPP <--- PMC	H1	.115	.014	8.214	.178	***	Supported
PMP <--- PMC	H2	1.022	.079	12.994	.906	***	Supported
PPP <--- PMP	H3	-.146	.030	-4.867	-.256	***	Supported
R-square (PMP) = .820							
R-square (PPP) = .151							
Project manager competencies (PMC), Project management practices (PMP), Perception of project performance (PPP)							
Unstandardized Coefficients (B), Standardized Coefficients (Beta)							

*** p<.01, ** p<.05, * p<.1

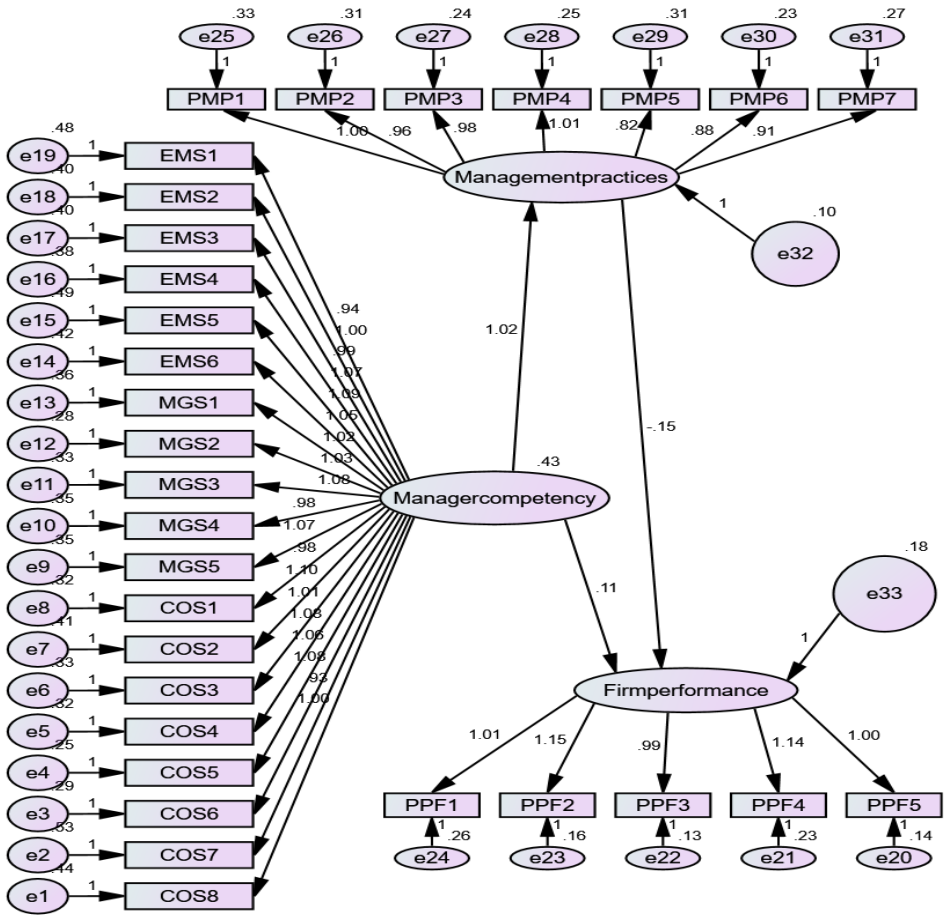

Figure 2 - Unstandardized estimates

Table 7 illustrates the findings regarding the indirect effect relationship, which were derived using the bootstrapping method with a sample size of 5000 and a confidence level of 95% (Banjanovic and Osborne, 2019; Streukens and Leroi-Werelds, 2016). Project management practice (B= -0.149, t =-6,773, p <0.01) partially mediates the relationship between project manager competencies and perception of project performance. The partial mediation was due to the significant direct relationship between project manager competencies and perception of project performance.

Table 7 - Indirect effect relationship

Relationship	B	Std. Error	t	Beta	Confidence interval		Sig.	Conclusion
					Lower bounds	Upper bounds		
PMC → PPM → PPP	**-.149**	**.022**	**-6.773**	**-2.534**	**-.432**	**.047**	****	**Partial mediation**
CMIN/DF (3.981), CFI (0.962), TLI (0.934) AGFI (0.823). SRMR (0.03), RMSEA (0.02)								
Unstandardized Coefficients (B), Standardized Coefficients (Beta), Confidence interval of 95% and bootstrap sample of 5000.								

*** p<.01, ** p<.05, * p<.1

5 DISCUSSION OF THE FINDINGS

The study's findings are of significant importance, shedding light on the intricate relationships between project management competencies, practices, and perceptions of project performance, particularly in the context of road and housing construction projects.

Firstly, project manager competencies, such as cognitive skills, strategic planning, and management skills, showed a positive and significant influence on the perception of project performance, consistent with prior studies by Sunindijo (2015), Masood et al. (2018), and Sang et al. (2018). These findings support the study's hypothesis, indicating that project managers with more excellent competencies, demonstrated through these specific skills, are more likely to positively influence stakeholders' opinions of project performance. This underscores the importance of investing in developing and improving project management skills among workers engaged in road and housing construction projects (Winch, 2009). Skilled project managers proficiently use their knowledge, abilities, and specialized understanding to enhance project results and stakeholder satisfaction (Blaskovics, 2016). Moreover, enhanced proficiencies enable project managers to effectively convey project objectives, manage stakeholder expectations, and resolve disputes, which significantly impact perceptions of project effectiveness (Meng and Boyd, 2017).

Secondly, project manager competencies demonstrated a positive and significant influence on project management practices, consistent with findings by Xue et al. (2020), supporting the study's hypothesis. This suggests that more competent project managers are better at adopting efficient project management methods. Improving project manager skills can lead to better implementation and execution of project management principles, ultimately enhancing project performance (Kerzner, 2018). Skilled project managers excel in formulating innovative approaches, adapting to evolving situations, and promoting cooperation among project team members (Meredith et al., 2017; Wysocki, 2011). Additionally, enhanced skills empower project managers to anticipate and proactively address foreseeable obstacles using appropriate project management methodologies.

Furthermore, project management practices exhibited a negative and significant influence on the perception of project performance. These significant results align with the findings of Ling et al. (2009) and Unegbu et al. (2022), supporting the study's hypothesis. This finding suggests that increasing the application of project management practices does not necessarily lead to improved views of project performance among stakeholders. Excessive or inflexible adherence to project management methods may result in bureaucratic inefficiencies or delays, negatively impacting stakeholders' perceptions of project performance (Ahimbisibwe et al., 2015; Kerzner, 2018). Moreover, project management techniques solely focused on technical criteria without considering stakeholders' broader needs and expectations may fail to create positive impressions of project performance (Davis, 2017).

Finally, project management practices partially mediate the relationship between project manager competencies and the perception of project performance. This indicates that project manager competencies directly influence how project performance is perceived, and implementing project management strategies also explains this link. Skilled project managers proficiently execute project management methodologies, subsequently influencing stakeholders' perspectives on project performance (Wu et al., 2020; Wu et al., 2018). Moreover, project management skills enable project managers to select and adapt project management methods tailored to the specific requirements and goals of road and housing construction projects, thereby improving perceptions of project performance (Kerzner, 2018; Walker, 2015). These findings suggest that investing in the development of project management competencies and the adoption of efficient project management practices can lead to improved project performance and stakeholder satisfaction.

6 CONCLUSION

Project management plays a pivotal role in ensuring the success of road and housing construction projects, necessitating meticulous planning and coordination from inception to completion. This study set out to delve into how project manager competencies influence the perception of project performance, with project management practices acting as a mediator. A descriptive cross-sectional design was employed to facilitate efficient data collection from project managers actively involved in Ghana's road and housing construction projects. Through a rigorous snowball sampling method, a robust sample of 333 project managers was selected, enabling a comprehensive examination of their perspectives.

The data were analyzed using confirmatory and CB-SEM, yielding significant findings contributing to the existing literature. The study revealed that project manager competencies positively and significantly influenced the perception of project performance and project management practices. Interestingly, project management practices were found to have a negative and significant influence on the perception of project performance. This suggests that while effective practices are essential for project success, they may not always align with stakeholders' perceptions. Moreover, the results indicated that project management practices partially mediate the relationship between project manager competencies and perceptions of project performance. This highlights the intri-

cate interplay between competencies, practices, and project outcomes in road and housing construction projects.

7 THEORETICAL IMPLICATION

The study enhances theoretical progress by emphasizing the interdependence of project management competencies and practices. It highlights the crucial role of competencies in shaping practices and their subsequent effect on project performance. This integration provides a more thorough comprehension of how individual abilities are transformed into successful project implementation and results.

Furthermore, the study introduces a novel perspective by recognizing project management practices as a mediator between competencies and project performance. This unique approach enhances our understanding of the mechanisms by which competencies exert their effect, thereby contributing to theoretical discussions. The discovery that competencies may not directly impact project outcomes but influence them through the intermediate effect of applied practice is a significant contribution to the field. Incorporating the mediating role of practices into theoretical frameworks in project management can enhance our knowledge of competency-performance linkages in a more sophisticated manner, thereby keeping the audience intrigued and engaged.

The study also underscores the adaptability of theoretical frameworks in project management to various project contexts. It highlights the significance of contextual factors in determining the efficacy of project management competencies and practices. The influence of practices on project performance can vary based on the specific attributes of the project environment. Theoretical frameworks that include contextual factors can explain the differences in the links between competency, practice, and performance in various project environments. This acknowledgement empowers project management practitioners and researchers by emphasizing the need for project management theories that can responsively adapt to various project contexts and requirements, thereby making them feel capable and confident in handling diverse project situations.

Furthermore, the paper promotes a comprehensive approach to project management theory beyond the conventional divisions between competencies and practices. The study emphasizes the interconnectedness and reciprocal impact of competencies and practices on project outcomes. It suggests a unified theoretical framework that recognizes competencies and practices as complementary aspects of project management effectiveness, in contrast to existing frameworks that often treat them as separate entities. This comprehensive viewpoint promotes theoretical progress that encompasses the diverse aspects of project management processes and offers more extensive guidance for practitioners and researchers.

8 MANAGERIAL IMPLICATION

The study highlights that project managers in road and housing construction should actively invest in developing leadership, communication, problem-solving, and risk management competencies to enhance project outcomes. Managers can implement structured training programs, mentorship initiatives, and scenario-based workshops to strengthen these skills and apply them directly to ongoing projects. For example, using risk management simulations can prepare managers for real-world project uncertainties, while communication exercises improve stakeholder engagement.

Managers should align their competencies with tailored project management approaches. By selecting and adapting techniques such as agile scheduling, phased project reviews, or resource optimization strategies to suit specific project contexts, they can maximize efficiency and meet stakeholder expectations. This alignment ensures that skills are applied strategically rather than generically.

Flexibility and continuous improvement are critical. Managers should conduct post-project evaluations, gather team feedback, and implement iterative adjustments to methods and processes. For instance, after completing a housing project, revising workflow strategies based on lessons learned can improve future performance. Encouraging a learning-oriented culture strengthens team engagement, enhances adaptability, and supports sustainable project success. These steps provide tangible, actionable guidance for managers while acknowledging that contextual differences may influence applicability across projects or regions.

9 LIMITATION OF THE STUDY AND FUTURE STUDIES

The study encountered limitations in identifying project managers in the housing and road sectors, as it involved moving from one construction site to another where project managers were actively engaged in various projects. Additionally, due to financial constraints, several regions in

Ghana were not covered, and the snowball sampling technique was used to recruit participants, limiting the physical accessibility of project managers used in the study.

Moreover, this study's findings are based on 333 project managers in road and housing construction projects in Ghana, which may limit the generalizability of the results to other regions, industries, or project types. Contextual factors, such as regulatory frameworks, organizational culture, and resource availability, may influence the applicability of these findings elsewhere. Future research could adopt cross-regional or multi-industry samples to validate and extend the results, enhancing external validity and providing broader insights into project management practices.

Future studies should focus on specific sectors, such as mining, schools, hospitals, and others, to deepen the understanding of project manager competencies and performance perceptions. Research recommendations include expanding the study's scope to include a more diverse sample and exploring the findings' applicability in different industries and contexts.

LIST OF ABBREVIATION

Adjusted Goodness-of-Fit Index (AGFI)
Average Variance Extracted (AVE)
Comparative Fit Index (CFI)
Confirmatory Factor Analysis (CFA)
Construction Project Manager (CPM)
Emotional Intelligence (EQ)
Goodness-of-Fit Index (GFI)
Green Building Construction (GBC)
Intellectual Intelligence (IQ)
Maximum Shared Variance (MSV)
Project Management Institute (PMI)
Project Management Practices (PMPs)
Root Mean Square Error of Approximation (RMSEA
Singaporean architectural, engineering, and construction (AEC)
Social Cognitive Theory (SCT)
Standardized Root Mean Square Residual (SRMR)
Structural Equation Modelling (SEM)
Tucker-Lewis Index (TLI), or Non-Normed Fit Index (NNFI)

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Section II: Project management practices Please indicate your disagreement or agreement with each statement by crossing the number best represents your preference.	Ne- ver	Ra- re-	So- me- ti-	Often	Al- ways
(1) Kick-off Meeting	1	2	3	4	5
(2) Progress Meetings	1	2	3	4	5
(3) Baseline Plan	1	2	3	4	5
(4) Customer Satisfaction Surveys	1	2	3	4	5
(5) Project Charter	1	2	3	4	5
(6) Project Issue Log	1	2	3	4	5
(7) Milestone Planning	1	2	3	4	5

Authors' contributions: Conceptualization, and data analysis LM. R.A wrote the introduction and literature. FKA did the methodology and discussion of the results and managerial implication. HOA did the editing and proofreading.

Appendix A

Section I: Project management competencies Please indicate your disagreement or agreement with each statement by crossing the number best represents your preference.	Never	Rarely	Some- times	Often	Always
Emotional skills					
(1) Interpersonal sensitivity	1	2	3	4	5
(2) Interpersonal skills	1	2	3	4	5
(3) Empathy	1	2	3	4	5
(4) Self-awareness	1	2	3	4	5
(5) Stress management	1	2	3	4	5
(6) Self-motivation	1	2	3	4	5
Cognitive skills					
(1) Vision and imagination	1	2	3	4	5
(2) Strategic perspective	1	2	3	4	5
(3) Critical analysis	1	2	3	4	5
(4) Intuitiveness	1	2	3	4	5
(5) Problem solving	1	2	3	4	5
(6) Decision-making	1	2	3	4	5
(7) Learning	1	2	3	4	5
(8) Creativity	1	2	3	4	5
Management skills					
(1) Planning	1	2	3	4	5
(2) Prioritizing	1	2	3	4	5
(3) Directiveness	1	2	3	4	5
(4) Organization and coordination	1	2	3	4	5
(5) Monitor and control	1	2	3	4	5
Section III: Perception on Project performance	N o t S —		N o t V e		E x t

Please indicate your disagreement or agreement with each statement by crossing the number best represents your preference.					
(1) The client was satisfied with the project quality.	1	2	3	4	5
(2) The client was satisfied with the project schedule.	1	2	3	4	5
(3) The client was satisfied with the project cost.	1	2	3	4	5
(4) Safety and environmental conditions in the course of project were satisfied.	1	2	3	4	5
(5) How satisfied was the contractor with the level of profitability of this project	1	2	3	4	5