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The Influence of Stakeholder Engagement on Sustainable Construction Project Delivery in

Riyadh

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ABSTRACT

This research work aimed to find the impact of SE on sustainable construction project delivery in Riyadh. The present study adopted a quantitative methodology and employed a descriptive research design. The target population for this research included key stakeholders involved in the CI within Riyadh. The sampling methodology utilized in this study was simple random sampling, and the target population was surveyed using a self-constructed questionnaire, which was developed after a comprehensive review of pertinent literature. An online link which was generated through Google Forms, was formed, and disseminated to the study participants. The data was analysed by employing statistical tests through MS Excel and SPSS. The study revealed a strong positive correlation ($r = 0.775$) between SE and sustainable construction project delivery. This finding underscores the importance of actively involving stakeholders throughout the project lifecycle to achieve better sustainability outcomes. When stakeholders are engaged effectively, it fosters a collaborative approach, leading to more successful project delivery in terms of environmental, social, and economic sustainability. Moreover, the regression analysis provided compelling evidence of the critical influence of SE on sustainable project delivery. This research work is limited to Riyadh, and the findings are not directly applicable to other regions. To gain a more thorough understanding of stakeholders' attitudes and perceptions, it would be beneficial to adopt a comprehensive approach that integrates qualitative research methods, such as interviews and focus groups. This would enhance the analysis by providing a more in-depth exploration of the subject matter.

Keywords

Stakeholder Engagement, Sustainable Construction Project Delivery

CHAPTER-I

INTRODUCTION

1.1 Background

The contemporary construction industry (CI) is significantly shaped by sustainable project deliveries and stakeholder engagement, which serve as its fundamental pillars and exert a profound impact on its practices, principles, and future trajectory. The CI has adopted a new paradigm that underscores the significance of ecological balance, social responsibility, and economic viability. This paradigm is a result of the intricate yet cohesive interplay between sustainability principles and stakeholder involvement (Adhi & Muslim, 2023).

The vital principle of Sustainable Construction (SC) is to reduce undesirable influences on the environment, maximize the efficient use of resources, and establish a constructed environment that is pleasant, healthful, and supportive of the inhabitants' welfare. The objective is to achieve an equilibrium between progress and conservation of the natural world by diminishing the conservation impact of industrial actions across all stages of a building's existence, including its conception, design, erection, operation, dismantling, and recycling. The interdependence of SC project deliveries and stakeholder engagement (SE) is a significant aspect of modern construction management. The overarching objective of this expansive domain is to implement methodologies that promote a sustainable built environment while concurrently fulfilling project specifications and addressing the interests of all relevant stakeholders (Aghaegbuna et al., 2020).

The delivery of SC projects entails the consideration of the ecological, social, and economic dimensions throughout the entirety of the construction process. The primary aim is to mitigate the adverse environmental effects linked to the entire lifespan of constructions and public works. The comprehensive evaluation of

sustainable building practices encompasses an extensive range of aspects, including but not restricted to material sourcing and utilization, energy efficiency during the design and construction phases, waste management, and eventual decommissioning or renovation (Jonsson & Yacobucci, 2019). The integration of the built environment with the natural environment is a key objective, with the aim of achieving a state of harmonious co-existence. The tenets of sustainability in the realm of construction are founded upon the objective of mitigating waste, curbing energy usage, advocating for recycling, and harnessing renewable resources. The objective is to create edifices that exhibit resource efficiency while also ensuring the well-being and comfort of their inhabitants. The industrial sector has shifted its focus towards the adoption of eco-friendly materials and procedures, incorporating cutting-edge technologies such as sustainable energy systems, renewable resources, and waste disposal strategies (Gu et al., 2023).

The implementation of SC entails a multitude of determinations at various phases, commencing from the inception and strategizing of the project, proceeding to the blueprint and erection stages, culminating in the operation and upkeep phase, and ultimately the dismantling phase. The decisions are geared towards attaining sustainability goals, encompassing the optimization of energy and water consumption, waste reduction, preservation of health and well-being, and augmentation of biodiversity and ecosystems (Abbas Elmualim & Doğa Alp, 2016).

SE is an essential component for the achievement of favourable outcomes in construction projects. The process of engaging all relevant stakeholders in a project, including clients, end-users, local communities, authorities, suppliers, contractors, and members of the public, is commonly referred to as stakeholder involvement. Efficient stakeholder involvement facilitates the inclusion of diverse perspectives and promotes a collective sense of accountability and ownership towards the project. The process guarantees that the

requirements and anticipations of every stakeholder are considered and fulfilled, resulting in greater triumphs and elevated levels of contentment (Fobbe & Hilletoft, 2021).

Furthermore, the engagement of stakeholders is of paramount importance in promoting SC practices. The involvement of stakeholders facilitates the identification of their concerns, requirements, and principles pertaining to the project (Maier & Aşchilean, 2020). The feedback received can be utilized to guide the design and construction process, thereby ensuring the incorporation of sustainability principles that align with the perspectives and interests of relevant stakeholders. Within the realm of sustainable construction, the involvement of stakeholders assumes heightened importance as it serves to facilitate the identification and implementation of sustainable solutions that effectively meet the needs and expectations of all parties involved (Li et al., 2022).

The amalgamation of SC project deliveries and SE is a pivotal aspect in the progression towards a sustainable built environment. The present approach, which is synergistic in nature, recognizes that the achievement of SC practices is contingent not solely upon the technical implementation of sustainable techniques but also upon the recognition and backing of these techniques by all parties involved. The facilitation of a more inclusive, sustainable, and robust built environment that meets the needs of both contemporary and future generations can be achieved through the implementation of effective SE strategies throughout the project life cycle (Mambwe et al., 2021).

The CI is currently placing significant emphasis on sustainability, with corresponding topics occupying a prominent position in construction management and practices. By incorporating SC project deliveries and implementing efficient SE strategies, the construction sector can make a substantial contribution towards achieving global sustainability objectives (Yang & Shen, 2015). This will result in the formation of a built environment that upholds and enhances the quality of life on our planet. A proficient system for delivering SC

projects must take into consideration the tripartite pillars of sustainability, namely the environment, society, and economy. From an environmental standpoint, the approach involves the incorporation of cutting-edge technologies that optimize the utilization of resources, curtail the production of waste, and diminish the ecological impact. One example is the implementation of construction techniques that improve energy efficiency, promote water conservation, and facilitate waste management. Additionally, integrating renewable energy systems into building design can also be beneficial (Vasconcelos et al., 2020).

SC endeavors to enhance the health and welfare of inhabitants and societies from a social perspective. The objective is to construct edifices that not only exhibit energy efficiency and eco-friendliness but also augment the standard of living for their inhabitants and occupants (Yang & Shen, 2015). The proposed approach entails integrating features that enhance the quality of indoor air, facilitate access to natural light, regulate noise levels, and foster the creation of areas that encourage social interaction and connectivity. From an economic standpoint, SC may necessitate a greater initial investment. However, the long-term benefits of decreased energy and water consumption, reduced maintenance expenses, and increased property value render it a financially feasible alternative. Furthermore, SC presents novel market prospects, fosters ingenuity, and has the potential to enhance regional economic growth through the utilization of local materials and labour (Wang et al., 2020).

SE is a fundamental element that underpins the development of SC projects. The implementation of efficient engagement procedures plays a crucial role in the establishment of a collective vision and reciprocal comprehension among diverse stakeholders. Maximizing project efficiency and outcomes can be achieved by considering the interests of all parties involved, thereby minimizing conflicts and misunderstandings. Involving stakeholders in the initial stages and throughout the project's lifespan fosters effective communication and openness, resulting in improved decision-making. The early identification of potential sustainability impacts,

opportunities, and risks is facilitated by this tool for project teams. Moreover, it enables the process of co-creation and shared responsibility among various stakeholders, thereby promoting collaborations that have the potential to generate novel sustainability solutions (Bal Menoka, 2014).

The swift urbanization of Riyadh has resulted in a surge of construction undertakings, thereby raising apprehensions regarding ecological sustainability, resource depletion, and the generation of waste (Maqbool et al., 2022). The employment of SC techniques is gaining recognition as a viable resolution; however, the implementation of these methods within the CI of Riyadh has been comparatively sluggish. The significance of SE in ensuring the successful delivery of SC projects has been acknowledged. However, its role in the context of Riyadh has not been extensively investigated. The various stakeholders involved in these projects, including clients, contractors, local communities, and regulatory bodies, frequently possess divergent interests and viewpoints concerning sustainability. Comprehending these dynamics is imperative in promoting SC practices. Nonetheless, a dearth of scholarly inquiry exists regarding the impact of SE on the delivery of SC projects in Riyadh. The objective of this study is to address the lack of information by investigating the relationship between SE and SC in the swiftly evolving urban landscape of Riyadh (Maqbool et al., 2022).

1.2. Problem Statement

In Riyadh, as the momentum towards sustainable construction practices intensifies, understanding the pivotal role of SE in shaping the delivery of such projects is imperative. This study addresses the pressing concern of how SE impacts the successful execution of sustainable construction endeavors in the Riyadh context. Despite the global emphasis on sustainability, Riyadh's construction sector encounters multifaceted challenges in ensuring the integration of environmentally conscious methodologies. The problem lies in the limited exploration of SE dynamics within the realm of sustainable construction projects. This gap hampers project outcomes, as stakeholders, including government entities, private developers, local communities, and

environmental organizations, possess distinct expectations, interests, and levels of involvement. The lack of a comprehensive understanding of stakeholder engagement's influence obstructs the formulation of effective strategies that harmonize diverse perspectives and priorities. Consequently, project delays, budget overruns, and suboptimal environmental outcomes persist. Addressing this problem demands an in-depth investigation into how SE practices align with the principles of sustainable construction in Riyadh, considering cultural, regulatory, and socio-economic dimensions. By elucidating the intricate interplay between SE strategies and sustainable project delivery, this research strives to provide actionable insights for project managers, policymakers, and industry stakeholders. Ultimately, the study aspires to foster a more integrated and harmonious approach that not only advances sustainable construction practices but also enhances Riyadh's urban development trajectory.

1.3. Research Objectives

The research objectives of this research work are:

- ❖ To assess the current level of SE in Sustainable construction projects in Riyadh.
- ❖ To examine the impact of SE on the delivery of Sustainable construction projects in Riyadh.
- ❖ To develop recommendations for improving SE practices in Sustainable construction project delivery in Riyadh

1.4. Research Questions

The research questions of this research work are:

- ❖ What is the current level of SE in Sustainable construction projects in Riyadh?
- ❖ What is the impact of SE on the delivery of Sustainable construction projects in Riyadh?

- ❖ What are the recommendations for improving SE practices in Sustainable construction project delivery in Riyadh?

1.5. Significance of Study

The CI is an essential component of growth in Riyadh, a city that is experiencing rapid development. However, the urban area encounters a multitude of ecological obstacles that require a transition towards more environmentally friendly building methodologies. The involvement of stakeholders is a crucial aspect of the transition towards SC practices. This research aims to investigate the impact of stakeholder perspectives and participation on the execution and achievement of SC initiatives in Riyadh. The analysis will have the potential to offer significant contributions to the understanding of the interplay and discrepancies among various stakeholder concerns. This, in turn, could facilitate the development of more efficacious approaches to SE (Adhi & Muslim, 2023).

Furthermore, comprehending the significance of SE in SC will have the potential to assist project managers, policymakers, and other pertinent stakeholders in Riyadh in promoting more sustainable and comprehensive construction methodologies. The eventual outcome of this process may involve the development of a constructed environment that conforms to the tenets of sustainability while simultaneously addressing the requirements and anticipations of all parties involved. Moreover, the results of this investigation could make a valuable contribution to the wider discussion on sustainable building practices and stakeholder involvement, enhancing the existing body of knowledge and potentially serving as a point of reference for other urban areas encountering comparable obstacles. In general, this study has the potential to establish a path towards a more environmentally sustainable future not only in Riyadh but also in other regions (Shaukat et al., 2021).

1.5.1. Managerial Relevance

The examination of stakeholder engagement's impact on the delivery of sustainable construction projects in Riyadh bears substantial managerial significance for the diverse stakeholders engaged in construction projects within the area. The industry has recognized sustainable construction as a crucial priority, and the rapid urban development in Riyadh requires effective project delivery to address environmental and societal needs. This research underscores the significance of SE in achieving successful sustainable project outcomes, thereby offering valuable insights for managers in the construction sector. Through the active engagement of stakeholders at various stages of the project, encompassing planning, execution, and post-completion phases, managers could promote a cooperative atmosphere that indorses the emergence of creative solutions, improves the quality of decision-making processes, and minimizes the likelihood of conflicts arising.

Furthermore, this study provides insights into the obstacles and prospects associated with sustainable construction in Riyadh, enabling managers to customize their approaches and methodologies accordingly. The comprehension of the distinct regional circumstances, regulatory structures, and anticipations of stakeholders provide managers with the ability to execute focused sustainability initiatives, optimize project schedules, and efficiently allocate resources. This research provides managers with valuable insights regarding the relationship between SE and the delivery of sustainable construction projects. These insights enable managers to develop comprehensive and well-informed strategies that maximize project performance, improve reputation, attract investors, and contribute to the sustainable urban development goals of Riyadh. Incorporating SE as a fundamental element of project management has the potential to enhance the efficacy, durability, and significance of construction projects in Riyadh while also serving as a paradigm for sustainable development within the wider construction sector.

1.5.2. Scientific Relevance

The study on the impact of SE on sustainable construction project delivery in Riyadh holds scientific significance due to its potential to enhance the current understanding in various fields of study. The text primarily focuses on the increasing worldwide apprehension regarding sustainability within the construction sector. It offers significant perspectives on the significance of engaging stakeholders to attain sustainable project results. Through the implementation of empirical research within the specific context of Riyadh, this study contributes to the existing body of literature concerning sustainable construction practices in the Middle East. This region is characterized by rapid urbanization and limited resources, which necessitate the exploration of innovative approaches to project delivery. The geographical emphasis enhances comprehension regarding the impact of cultural, regulatory, and socio-economic elements on stakeholder cooperation and the implementation of sustainable projects.

Moreover, this research has the capacity to make a valuable contribution to the advancement of sustainable construction frameworks and best practices through the identification of effective strategies for engaging stakeholders. The findings can be utilized as a point of reference for forthcoming projects in Riyadh and comparable regions. They can provide guidance to stakeholders in enhancing their collaborative endeavours with the aim of attaining sustainable development objectives. The study contributes to the academic field by providing a deeper comprehension of project management and sustainability theories, with a specific focus on the significance of stakeholder theory and its practical implementation within the CI. This study provides opportunities for future investigation into stakeholder engagement, sustainable practices, and their interrelationships, prompting scholars to examine these subjects within diverse contexts and industries.

CHAPTER-II

LITERATURE REVIEW

SC is a constituent element of the broader sustainable development program, which endeavours to foster resource efficiency, curtail environmental degradation, and augment the physical and mental welfare of the occupants of these edifices (Silvius & Schipper, 2014). According to Akinola (2020) SC refers to the development and conscientious administration of a wholesome constructed environment that is founded on resource-efficient and ecological principles. Mambwe et al. (2021) highlighted in their study that SC encompasses the complete lifespan of a building, which encompasses the phases of design, construction, operation, and end-of-life. The imperative to pursue sustainability in the CI has been acknowledged as crucial in response to rising environmental pressures and the need for optimal resource utilization (Shaukat et al., 2021). While the study by Li et al. (2022) revealed that stakeholders in Guangdong emphasized the importance of government policies and guidelines, those in Hong Kong and Macao placed greater importance on market mechanisms and public-private partnerships.

2.1. Stakeholder Engagement: Concept and Importance in Sustainable Construction Projects

Bal et al. (2013) showed that the involvement of stakeholders is of paramount importance in sustainable construction projects as it facilitates the establishment of collaborative decision-making mechanisms and guarantees the congruence between project goals and stakeholder concerns. Mathur et al. (2018) highlighted that SE is frequently characterized as the systematic inclusion of individuals, groups, or organizations that possess a vested interest in the desired results of a project. Within the realm of sustainable construction projects, stakeholders encompass a range of individuals and entities. These include project clients,

contractors, architects, project managers, construction workers, suppliers, local communities, and pertinent government authorities engaged in the construction approval process. The involvement of stakeholders in such projects is crucial due to the potential influence of their perspectives, knowledge, and influence on the project's overall success and long-term viability (Valdes-Vasquez & Klotz, 2013; Mathur et al., 2018).

The study by Yang & Zou (2014) stated that SE plays a crucial role in sustainable construction projects by enabling the identification of common objectives and fostering collaboration among diverse entities. Eskerod & Huemann (2013) highlighted Freeman's Stakeholder Theory which posits that stakeholders possess the capacity to exert either a direct or indirect influence over a given project, thereby potentially impacting, or being impacted by its resultant outcomes. According to De Brucker et al. (2013) The inclusion of stakeholders in the decision-making process of a project contributes to the development of a stronger sense of ownership and responsibility among them, ultimately resulting in more sustainable project outcomes. The significance of SE in sustainable construction projects is emphasized by the numerous advantages it provides. One of the primary benefits of SE is its ability to enhance project outcomes through the incorporation of a wide range of perspectives and knowledge. The study Heravi et al. (2015) stated that the involvement of stakeholders can yield significant contributions in terms of understanding the environmental and social ramifications, thereby facilitating the adoption of well-informed and sustainable decisions at every stage of the project's development.

In addition, Cundy et al. (2013) revealed that the process of engaging stakeholders promotes the values of transparency and trust within project teams and the communities that are impacted. The inclusion of local communities in the decision-making process facilitates the identification of potential concerns and allows the project to proactively address them, thereby mitigating conflicts and disruptions that may arise during the construction phase. The importance of SE has been recognized as a crucial element for the effective execution of SC practices (Maier & Aşchilean, 2020; Shaukat et al., 2021). According to Lühr et al. (2020) stakeholders

refer to any individual or group that has the potential to impact or be impacted by an organization's objectives. Within the realm of construction endeavours, stakeholders may encompass a variety of entities such as patrons, builders, vendors, neighbouring populations, and governing agencies. According to Silvius & Schipper's (2014) research, the involvement of stakeholders in construction projects has been shown to yield various advantages, including but not limited to better decision-making, decreased conflicts, and improved project results.

The practice of SE serves to foster social inclusivity and empowerment, particularly among marginalized communities (Bal et al., 2013). Various stakeholders, such as local communities and non-governmental organizations, are actively involved in expressing their concerns and advocating for the consideration of their interests. This active engagement serves to advance social equity and facilitate the equitable distribution of benefits derived from the project. According to a study conducted by Waligo et al. (2013) it was discovered that the involvement of stakeholders has a beneficial impact on the performance of construction projects. This involvement results in improved compliance with project schedules, budgets, and quality benchmarks. The implementation of SE strategies has been shown to significantly improve the efficiency and effectiveness of projects, leading to successful project delivery.

In addition, Watson et al. (2017) stated that the involvement of stakeholders in sustainable construction projects is in accordance with the Sustainable Development Goals (SDGs) set by the United Nations. This practice promotes responsible consumption, climate action, and the development of sustainable communities. However, the achievement of effective SE necessitates the surmounting of numerous obstacles. Some of the prevalent challenges include limited stakeholder awareness, resistance to change, and insufficient resources for engagement. The imperative to address these challenges necessitates the establishment of effective communication channels and the active engagement of stakeholders (Hwang, 2013).

According to Silvius & Schipper (2014) the inclusion of stakeholders throughout the entirety of a project's lifespan requires the implementation of a methodical strategy for identifying, analyzing, and managing stakeholders. The utilization of stakeholder mapping and analysis instruments, such as the Power-Interest Matrix and Influence-Interest Grid, can facilitate the identification of significant stakeholders and the customization of engagement strategies according to their respective degrees of influence and interest in the project. The significance of early SE in sustainable construction projects was underscored in a study conducted by Marcelino-Sádaba et al. (2015). The involvement of stakeholders at an early stage facilitates their active participation in project planning, the establishment of sustainability objectives, and the identification of potential risks and opportunities. The incorporation of SE during the initial phase of a project increases the probability of attaining sustainability goals (Waligo et al., 2013; Yang & Zou, 2014).

In addition, the study by Adhi & Muslim (2023) revealed that effective SE strategies significantly enhance the implementation of SC centered on Lean philosophies in Indonesia. Key findings include the importance of early and continuous involvement of stakeholders during the project life-cycle, transparent communication, and collaborative decision-making processes. It was also found that training and capacity building for stakeholders improved their understanding of Lean and SC principles, leading to more effective implementation. Furthermore, the study suggested that aligning stakeholder interests with the project's sustainability objectives could significantly increase project performance and sustainability outcomes.

2.2. Sustainable Construction Project Delivery: Notion and Key Dimensions

Amidst the current epoch of climate change and ecological deterioration, there exists a pressing need to embrace sustainable methodologies within the realm of construction, as noted by Nonet et al. (2022). The significance of SE in this process is of utmost importance. The attainment of SC project deliveries necessitates the active participation of all stakeholders. Incorporating sustainable methodologies into construction project

deliveries and implementing comprehensive SE processes can result in the development of infrastructure that not only satisfies current demands but also exhibits flexibility and durability in the face of forthcoming obstacles (Shaukat et al., 2021). The incorporation of these methodologies denotes a change in the ethos and approach of the construction sector towards ecological soundness, thereby establishing a field that values and amplifies the quality of our environment. Through this approach, noteworthy progress can be made in attaining worldwide sustainability objectives and establishing a constructed environment that accommodates the requirements of both current and forthcoming generations (Nonet et al., 2022).

Kibert (2016) indicated that the delivery of sustainable construction projects involves multiple crucial dimensions that are essential for attaining environmentally, socially, and economically responsible results. The environmental dimension of sustainable construction project delivery is centered on the objective of reducing the project's environmental footprint throughout its entire lifecycle. This encompasses the reduction of resource consumption, waste generation, and carbon emissions. Lambrechts et al. (2019) highlighted that sustainable construction practices, encompassing green building design, energy-efficient technologies, and the integration of renewable energy sources, are fundamental components within this domain. According to a study conducted by Tam & Tam (2016), the inclusion of sustainable building materials, efficient water management, and low-impact site development had a substantial impact on the environmental performance of construction projects. The environmental dimension also places emphasis on the implementation of sustainable procurement practices, which involve the utilization of materials that have lower ecological footprints (Cundy et al., 2013). Additionally, it involves the consideration of life-cycle assessments to make informed decisions that are environmentally conscious (Bryde et al., 2013; Allen & Iano, 2019).

According to Silvius & Schipper (2014) the social dimension of sustainable construction project delivery focuses on the advancement of social well-being, equity, and inclusivity. The process encompasses

active participation and advantageous outcomes for nearby communities, the promotion of equitable labor practices, and the improvement of the overall well-being of individuals involved in the project. Ihuah et al. (2014) indicated that socially responsible construction projects encompass a range of practices that prioritize community engagement, including soliciting input through consultations, conducting thorough social impact assessments, and actively fostering local employment and skills development initiatives. The significance of SE and community involvement in promoting social sustainability within construction projects was emphasized in a study conducted by Lu & Yuan (2017). The social dimension of a given context also encompasses various considerations, such as those related to health and safety, worker welfare, and the preservation of cultural heritage. These factors contribute to fostering positive social outcomes within the given context (Eskerod & Huemann, 2013; Cundy et al., 2013).

The economic dimension of sustainable construction project delivery places emphasis on the financial feasibility and long-term economic advantages of projects, as asserted by Meredith et al. (2017). This encompasses the implementation of construction practices that are economically efficient, the effective management of resources, and the prioritization of life-cycle cost assessments. Sustainable construction projects effectively incorporate economic considerations alongside environmental and social objectives. Yeheyis et al. (2013) conducted a study which revealed that the incorporation of sustainability principles in construction projects resulted in enhanced cost performance and increased value for money. Sustainable construction additionally fosters innovation and facilitates the exchange of knowledge, thereby contributing to the long-term economic competitiveness within the industry (Harris et al., 2021; Allen & Iano, 2019).

According to Bocchini et al. (2014) resilience and adaptation have become prominent aspects of sustainable construction project delivery, with a specific emphasis on equipping projects to endure and effectively address forthcoming uncertainties and the impacts of climate change. Projects that possess the

ability to adapt can effectively respond to evolving environmental conditions, technological advancements, and the needs of the community (Eadie et al., 2013). Adaptation measures encompass various strategies such as climate-responsive design, disaster risk reduction strategies, and the incorporation of flexibility in project planning and design. Osei-Kyei & Chan (2017) conducted a study that underscored the significance of climate resilience within the realm of construction projects. The study emphasized the imperative of incorporating resilience measures into infrastructure development as a means of effectively mitigating risks associated with climate change.

The dimension of collaboration and partnership underscores the significance of involving a wide range of stakeholders, establishing partnerships, and promoting collaboration throughout the entirety of the project's lifespan (Wong & Zhou, 2015). The successful implementation of sustainable construction projects necessitates the collaboration and coordination of various stakeholders, including government agencies, private sector entities, non-governmental organizations, and local communities. Collaborative endeavors facilitate the consolidation of specialized knowledge, available resources, and expertise, thereby resulting in the development of more comprehensive and enduring solutions. The importance of public-private partnerships in sustainable construction projects was underscored in a study conducted by Liu et al. (2020). The study demonstrated how collaboration contributes to the success of projects and yields wider societal advantages.

2.3. Impact of Stakeholder Engagement on Sustainable Construction Projects

Oppong et al. (2017) indicated that the inclusion of stakeholders in a meaningful and comprehensive manner during the initial phases of project planning and design plays a crucial role in achieving sustainable construction outcomes. The involvement of various stakeholders, such as local communities, regulatory authorities, and environmental experts, plays a crucial role in the identification of potential risks and

opportunities pertaining to sustainability. The study conducted by Liu et al. (2019) demonstrated that the inclusion of stakeholders during the design phase resulted in the incorporation of environmentally friendly construction methods and energy-efficient technologies. The inclusion of stakeholder input during this phase guarantees that sustainability objectives are harmonized with local requirements and environmental factors, thereby promoting a project design that is both more effective and sustainable.

Yang et al. (2016) revealed that SE assumes a crucial role in augmenting the environmental performance of sustainable construction projects. Stakeholders who are actively involved can provide valuable perspectives on environmentally sustainable materials, strategies for effective waste management, and opportunities for utilizing renewable energy sources. The study conducted by Arditi et al. (2019) found that the inclusion of stakeholders in construction projects resulted in a decrease in greenhouse gas emissions and resource consumption. The adoption of sustainable practices in projects is facilitated by collaborative efforts among various stakeholders, including contractors, architects, and environmental experts. This collaboration contributes to the reduction of ecological footprints and the mitigation of environmental impacts.

Provasnek et al. (2017) highlighted that the promotion of social inclusivity and community development in sustainable construction projects is facilitated through the active involvement of stakeholders, with a particular emphasis on local communities and social organizations (Waligo et al., 2013). Engaging in consultations with impacted communities facilitates the identification of their needs, concerns, and aspirations, thereby resulting in the development of projects that are better aligned with community interests. The study conducted by Lu et al. (2018) provided evidence to support the notion that SE plays a crucial role in fostering community empowerment and enhancing social well-being within the context of construction projects. The active engagement of stakeholders also presents prospects for the promotion of local employment, the

enhancement of skills, and the development of capacity, thereby making a valuable contribution to social equity and inclusivity (Wong & Zhou, 2015; Marcelino-Sádaba et al., 2015).

The study by Li et al. (2013) stated that the promotion of transparency and accountability in decision-making processes is facilitated by SE in sustainable construction projects. Engaging in open dialogue and facilitating the exchange of information with stakeholders fosters the development of trust and enhances the credibility of the project team. The study conducted by Zhang et al. (2020) found that the involvement of stakeholders resulted in enhanced project governance and risk management. The implementation of transparent practices in project decision-making is crucial for ensuring that the results of the project are in line with the expectations of stakeholders and sustainability objectives. This approach serves to minimize the occurrence of conflicts and bolster the credibility of the project. According to Aghaegbuna et al. (2020), the effective implementation of SC projects necessitates the participation and cooperation of all parties involved, along with comprehension and synchronization of their varied concerns, requirements, and anticipations (Bahadorestani et al., 2020; Aghaegbuna et al., 2020).

The engagement of stakeholders plays a crucial role in fostering innovation and facilitating the exchange of knowledge within sustainable construction projects (De Brucker et al., 2013). Collaborative interactions among stakeholders facilitate the sharing of best practices, novel ideas, and technological advancements. The study conducted by Chan & Chan (2017) brought attention to the significance of SE in facilitating the implementation of sustainable construction technologies and practices. The active involvement of stakeholders in driving innovation facilitates the adoption of advanced sustainable solutions, thereby propelling the CI towards enhanced sustainability (Cundy et al., 2013; Bocchini et al., 2014).

The engagement of stakeholders plays a significant role in ensuring the enduring success and legacy of sustainable construction projects as noted by Allen & Iano (2019). The active engagement of stakeholders

throughout the entire duration of a project guarantees the ongoing monitoring and resolution of sustainability objectives. According to a study conducted by Alshawi et al. (2016), it was found that the involvement of stakeholders played a significant role in enhancing the long-term economic sustainability and social acceptance of projects. Stakeholders who are actively involved can also contribute to the post-construction phase, thereby ensuring the sustainable operation of projects and the delivery of positive outcomes that extend beyond the completion stage (Bryde et al., 2013; Oppong et al., 2017).

The intersection between SE and SC is a significant topic in the field of literature. According to Yang & Shen (2015), there exists a favourable correlation between SE and sustainability performance in construction projects, as evidenced by various research studies. According to Tan et al. (2019) study, the involvement of stakeholders can have an impact on the implementation and efficacy of SC methods. Nonetheless, Silvius & Schipper (2014) suggest that the involvement of stakeholders in SC is a multifaceted undertaking that is subject to a range of factors, including stakeholder attributes, project setting, and engagement approaches (Tan et al., 2019; Yang & Shen, 2015).

Moreover, Bahadorestani et al. (2020) found that conflicts among stakeholders can hinder the success of SC projects. The assessment of conflicting interests at the early planning stages was found to be crucial for sustainable stakeholder engagement. The research identified several key conflict areas, such as disagreements over project objectives, variations in understanding sustainability, and disparities in expected project outcomes. The findings emphasized the need for a proactive approach to managing conflicting interests, which includes recognizing potential conflicts, facilitating open dialogues, and negotiating mutually beneficial solutions.

The research by Bal Menoka (2014) found a positive correlation between SE and sustainability-related project performance in construction. Projects with higher levels of SE were found to exhibit better performance

in terms of sustainability indicators such as energy efficiency, water conservation, and waste reduction. The study also found that projects with a structured SE plan had better sustainability outcome. The findings suggested that regular communication, inclusion of stakeholder inputs in decision-making, and respect for stakeholder interests were critical for enhancing sustainability performance. The research further underscored the importance of engaging a wide range of stakeholders, including end-users and local communities, to ensure a broader perspective on sustainability.

2.5. Strategies and Best Practices for Effective SE in Sustainable Construction Projects

The involvement of stakeholders is an essential element in the attainment of sustainability objectives within construction projects. The study by Bal et al. (2013) found that the main benefits include better project outcomes, increased sustainability, improved reputation, and enhanced stakeholder relationships. The study also emphasized that the integration of stakeholders' perspectives can lead to the development of more sustainable materials and building methods. However, the main challenge remains to create an open dialogue where all stakeholders are willing to compromise and align their interests towards sustainability. Likewise, Maier & Aşchilean (2020) indicated that effective stakeholder management facilitates improved communication, mitigates risks, and fosters partnerships that contribute to project success and sustainability. Furthermore, the study highlighted that a lack of adequate stakeholder management could lead to conflicts, project delays, and, ultimately, reduced sustainability. Thus, the study recommends implementing robust stakeholder management strategies for a more SC industry.

2.5.1. Identification and Analysis of Stakeholders:

Eskerod & Huemann (2013) indicated that the initial stage of proficient SE involves the process of identifying and analyzing pertinent stakeholders. Stakeholders involved in sustainable construction projects

encompass a range of entities, such as project clients, contractors, architects, local communities, environmental organizations, and governmental authorities. The significance of recognizing and assessing the interests, power, and influence of primary and secondary stakeholders in a project was underscored in a study conducted by Kocmanová et al. (2016). The utilization of stakeholder mapping and analysis tools, such as the Power-Interest Matrix and Influence-Interest Grid, allows project teams to effectively classify stakeholders and customize their engagement strategies according to the stakeholders' respective levels of interest and influence.

2.5.2. Early Engagement and Collaborative Planning

The study by Valdes-Vasquez & Klotz (2013) found that the involvement of stakeholders at an early stage is crucial for ensuring the success of sustainable construction projects. Incorporating stakeholder involvement during the initial phases of project initiation and planning facilitates the integration of their perspectives in shaping project goals, objectives, and strategies. The research conducted by Arditi & Polat (2017) emphasized the significance of early involvement in fostering collaboration among stakeholders and establishing trust and mutual comprehension. The inclusion of sustainability considerations at an early stage facilitates the incorporation of environmental and social objectives into the project's vision, thereby ensuring their integration into the project design from the beginning (Watson et al., 2017).

2.5.3. Transparent Communication and Information Sharing

The study by Sterling et al. (2017) revealed that the establishment of effective communication plays a pivotal role in the engagement of stakeholders within sustainable construction projects. The establishment of transparent and timely communication plays a pivotal role in cultivating trust and nurturing positive relationships among various stakeholders. The significance of effectively communicating project progress, environmental impacts, and community benefits to stakeholders was underscored in a study conducted by Lu

et al. (2016). By employing various communication channels, such as public meetings, project websites, and social media platforms, it is ensured that stakeholders are kept well-informed and actively involved throughout the entire duration of the project (Martens & Carvalho, 2017).

2.5.4. Collaboration and Partnerships

The establishment of collaboration and partnerships among stakeholders is of paramount importance in ensuring the success of sustainable construction projects (Meredith et al., 2017). The establishment of productive collaborations among project teams, local communities, and pertinent organizations fosters the facilitation of collective decision-making processes and the exchange of resources. The research conducted by Liu et al. (2020) brought attention to the positive impact of public-private partnerships on sustainable construction practices and project outcomes. Collaborative endeavors bolster the efficacy and potency of sustainability endeavors through the amalgamation of expertise, resources, and knowledge from a wide array of stakeholders (Martens & Carvalho, 2017).

2.5.5. Inclusivity and Empowerment

The practice of inclusive SE aims to ensure that all parties who are impacted by a particular decision-making process are provided with the opportunity to express their perspectives and contribute to the discussions (Silvius & Schipper, 2014a). In addition, Sterling et al. (2017) indicated that the active involvement of a wide range of stakeholders, including individuals from marginalized communities and representatives from local communities, contributes to the promotion of social equity and empowerment. The study conducted by Chen et al. (2017) highlighted the importance of stakeholder empowerment within sustainable construction projects, which ultimately results in heightened community ownership and support. The involvement of

stakeholders in project planning and implementation is enhanced through the implementation of capacity-building and skills development programs, thereby empowering them.

2.5.6. Continuous Monitoring and Feedback Mechanisms:

Doh & Quigley (2014) indicated that Monitoring and feedback mechanisms play a crucial role in assessing the efficacy of SE initiatives in sustainable construction projects. Frequently soliciting feedback from stakeholders enables project teams to evaluate the degree of satisfaction and effectively address emerging concerns. The research conducted by Herremans et al. (2015)) underscored the importance of ongoing involvement to effectively respond to evolving stakeholder dynamics and project demands. Feedback loops facilitate the ability of project teams to make well-informed decisions and enhance sustainability strategies through the incorporation of stakeholder input (Herremans et al., 2015; Li et al., 2013).

2.5.7. Consideration of Cultural and Social Context

As the study by Hossain et al. (2020) stated that the inclusion of cultural and social contexts is imperative for the successful implementation of SE strategies in sustainable construction projects. The comprehension and appreciation of indigenous customs, traditions, and values are imperative for effectively engaging with heterogeneous communities. The significance of cultural sensitivity in SE was emphasized in a study conducted by Ardit et al. (2019). This study emphasized that cultural sensitivity plays a crucial role in establishing trust and promoting cooperation between project teams and local communities (Hwang, 2013; Kocmanová et al., 2016).

2.6. Theoretical Framework

The theoretical framework for investigating the impact of stakeholder involvement on the execution of sustainable building projects in Riyadh is based on two key ideas: SC and stakeholder theory. The correlation between these two notions engenders a holistic viewpoint regarding the progression of the construction sector towards increasingly sustainable methodologies (Adhi & Muslim, 2023). The notion of SC is a complex concept that is grounded in the wider domain of sustainable development (Akinola, 2020). The aim is to achieve equilibrium among ecological, financial, and societal considerations throughout the entirety of constructed spaces' existence, encompassing their conception, erection, utilization, and eventual decommissioning. The concept of sustainability in the CI pertains to the mitigation of the ecological footprint of buildings and infrastructure, optimization of resource utilization, and advancement of the physical and mental health, welfare, and standard of living of their occupants (Aghaegbuna et al., 2020).

The framework integrates various SC models and principles from the relevant field. The Green Building concept prioritizes the development and construction of buildings with the aim of minimizing their ecological footprint and promoting human well-being. This may encompass various strategies aimed at enhancing energy /water efficiency, waste lessening, and indoor ecological quality (Vasconcelos et al., 2020).

The Life-Cycle Assessment (LCA) principle constitutes a fundamental component of the framework. The LCA approach is a standard practice employed to assess the environmental impacts that are linked with every stage of a product's life, starting from the abstraction of raw materials to the eventual disposal or recycling. Within the CI, the utilization of Life Cycle Assessment (LCA) has the potential to facilitate the identification of the most noteworthy environmental ramifications and the specific phases during which they transpire. This, in turn, can provide guidance for the formulation of effective strategies aimed at mitigating these impacts (Valdivia et al., 2021).

In contrast, stakeholder theory highlights the significance of considering the concerns and interests of all parties and entities that possess a vested interest in each decision or course of action. Freeman's seminal work on stakeholder theory posits that the success of an organization is contingent upon its adeptness in managing its relationships with all its stakeholders. The statement posits that the attainment of SC project objectives is contingent upon the efficacious involvement of stakeholders. Within the realm of construction, stakeholders may encompass a diverse range of entities, such as clients, architects, contractors, suppliers, government agencies, local communities, and environmental factors. The project's sustainability goals and outcomes may be influenced by the varying needs, interests, and expectations of different stakeholder groups (Valentinov, 2021),

The framework integrates diverse models derived from stakeholder theory. The Stakeholder Salience model, as proposed by Mitchell, Agle, and Wood, posits that the significance of stakeholders to an organization is contingent upon three key attributes, namely power, legitimacy, and urgency. Comprehending the significance of diverse stakeholders may facilitate project managers in prioritizing their engagement endeavours and devising tactics to proficiently handle varying stakeholder concerns (Jonsson & Yacobucci, 2019).

The incorporation of SC and stakeholder theory into the theoretical framework facilitates a thorough investigation of the impact of SE on the delivery of SC projects. Through comprehending the interdependencies among stakeholders, their concerns, and sustainability consequences, it is plausible to formulate efficacious approaches for stakeholder involvement and sustainable building methodologies in Riyadh and analogous settings. This framework offers a sturdy basis for investigating the intricate and ever-changing characteristics of delivering SC projects in swiftly growing urban areas (Fobbe & Hilletoft, 2021).

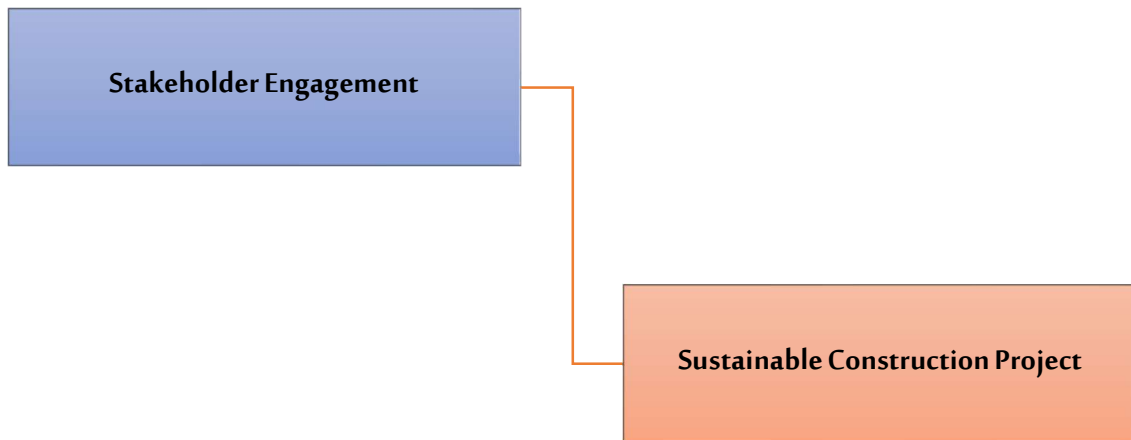


Figure 1: Theoretical Framework

2.7. Research Hypothesis

H₁: Effective SE practices are positively associated with the level of implementation of Sustainable construction practices in projects in Riyadh.

H₂: Higher levels of SE led to improved sustainability outcomes in construction projects in Riyadh.

H₃: There is a positive relationship between SE and stakeholder satisfaction in Sustainable construction projects in Riyadh.

CHAPTER-III

RESEARCH METHODOLOGY

The present study adopted a quantitative methodology and employed a descriptive research design. The target population for this research included key stakeholders involved in the CI within Riyadh. These stakeholders comprised project clients, contractors, architects, project managers, construction workers, suppliers, local communities, and relevant government authorities involved in the construction approval process. For this study, approximately 284 participants were selected, proportionally distributed among the different stakeholder groups. The sampling methodology utilized in this study was simple random sampling, which is a fundamental and extensively employed technique in quantitative research. To achieve a comprehensive and unbiased sample from the specific population of stakeholders engaged in the CI in Riyadh, this approach provided an equitable chance for every individual within the population to be chosen for inclusion. The present study utilized primary data analysis, with an online survey serving as the chosen method for data collection. The target population was surveyed using a self-constructed questionnaire, which was developed after a comprehensive review of pertinent literature. An online link which was generated through Google Forms, was formed and disseminated to the study participants for the purpose of accessing the survey instrument through different social media platforms. The data were carefully checked for completeness and accuracy before being subjected to statistical analysis using appropriate software such as SPSS and were analyzed by employing statistical tests through MS Excel and SPSS.

3.1. Research Approach

This research work employed the quantitative method with descriptive research design and utilized the primary method data to attain first-hand information which can be utilized to evaluate and describe the

outcomes. The quantitative method includes the collection and evaluation of statistical data to test the research hypothesis and to find out how the diverse variables are associated and related. This research method is mostly utilized in the natural and social sciences because it permits scholars to obtain statistical inferences about the targeted population. In this quantitative approach, the researchers can employ a statistical approach to investigate the data, making conclusions about the entire population cantered on the sample and just simply putting the research hypothesis about the correlation between the research variables to the statistical test (Sheard, 2018).

In addition, in the quantitative research design, there are several methods and designs which can be used. One of the quantitative research designs is experimental design, in which the researchers study the impact of a variation in one or more independent variables on the research dependent variables. Correspondingly, the quasi-experimental research design is utilized to contrast the two groups, and on the other hand, the non-experimental design includes the data collection on the subjects in the natural setting without changing the setting, and it includes the survey and observational research. This research work assesses the findings considering the topic of research, and its limitation was also considered. By employing this quantitative method, the research collected and evaluated the data to make inferences and to test the hypothesis. The prime objective of this approach is to determine whether a hypothesis or broad theory is supported by the currently present research evidence (Mohajan, 2020).

3.2. Research Design

The research design employed in this study was a descriptive approach, with the objective of offering a comprehensive and detailed portrayal of SE in the context of sustainable construction project delivery in Riyadh. Descriptive studies are employed to comprehend the aspects of the population and the relationship between the diverse factors (Doyle et al., 2019). The methodology employed in this study encompassed the

collection of primary data via an online survey distributed to various key stakeholders. These stakeholders comprised project clients, contractors, architects, project managers, construction workers, suppliers, local communities, and pertinent government authorities (Siedlecki, 2020). A self-designed survey instrument was created after conducting a comprehensive examination of pertinent scholarly sources, guaranteeing the inclusion of crucial variables and factors that impact stakeholder involvement. The survey instrument was specifically developed to gather data on stakeholders' perceptions, attitudes, and experiences related to their participation in sustainable construction projects (Daniel, 2016).

The survey responses were summarized and presented using descriptive statistics, including measures such as the mean, median, and standard deviation. The analysis also encompassed correlation analysis to investigate the connections between various variables pertaining to SE in sustainable construction projects. The results obtained from the analysis of the data were interpreted, and conclusions were drawn to improve our comprehension of the significance of SE in facilitating the successful execution of sustainable construction projects in Riyadh. The utilization of a descriptive research design yielded significant findings and established a fundamental basis for subsequent investigations and the formulation of policies pertaining to sustainable construction methodologies (Doyle et al., 2019).

3.3. Target Population (Sampling Technique and Sample Size)

The target population for this research included key stakeholders involved in the CI within Riyadh. These stakeholders comprised project clients, contractors, architects, project managers, construction workers, suppliers, local communities, and relevant government authorities involved in the construction approval process. Considering the large number of potential participants and the necessity of obtaining a representative sample, a simple random sampling technique was adopted. This approach ensured that each group within the target population was adequately represented, enhancing the validity of the research findings. The sample size

was determined based on feasibility and the need for a broad representation of stakeholder views. For this study, approximately 284 participants were selected, proportionally distributed among the different stakeholder groups. The final sample depended on the response rate and the willingness of potential participants to take part in the study. This approach allowed the researcher to capture a wide range of perspectives and experiences, providing a comprehensive understanding of the role of SE in sustainable construction project delivery in Riyadh (Taherdoost, 2016).

3.4. Research Sampling

The sampling methodology utilized in this study was simple random sampling, which is a fundamental and extensively employed technique in quantitative research. To achieve a comprehensive and unbiased sample from the specific population of stakeholders engaged in the CI in Riyadh, this approach provided an equitable chance for every individual within the population to be chosen for inclusion. The initial step in the sampling procedure involved compiling a thorough list of potential participants, encompassing project clients, contractors, architects, project managers, construction workers, suppliers, local communities, and pertinent government authorities. A distinct identification number was assigned to each entity or individual mentioned in the list. A sample of participants was randomly selected from the list using a random number generator or a similar tool. This procedure ensured that each stakeholder within the population was provided with an equitable opportunity to be included in the study. The determination of the sample size was based on considerations of practicality and the requirement for a comprehensive representation of perspectives from various stakeholders (Bujang et al., 2018).

Following the selection of the sample, the stakeholders who were identified were contacted and provided with information regarding the study. Prior to their participation, informed consent was obtained from each stakeholder. The utilization of this sampling methodology facilitated an impartial and methodical

approach to the selection process, thereby mitigating the potential for selection bias and guaranteeing the accurate representation of the viewpoints and experiences of the entire designated population. The study sought to employ the method of simple random sampling to generate results that could be extrapolated to the wider population of stakeholders engaged in the implementation of sustainable construction projects in Riyadh. The aforementioned methodology established a robust framework for deriving significant inferences and formulating well-informed judgments from the gathered data, thereby augmenting the credibility and dependability of the research outcomes (Alvi, 2016).

3.5. Data Collection Approach

The present study utilized primary data analysis, with an online survey serving as the chosen method for data collection. The target population was surveyed using a self-constructed questionnaire, which was developed after a comprehensive review of pertinent literature. The questionnaire contained the Likert scale questions (Strongly disagree 1 to Strongly Agree 5) and consisted of two major sections. The first part of the questionnaire contained the demographics questions, and the second part of the questionnaire contained the questions related to the stakeholder's engagement and sustainable construction (Johnson et al., 2018). The data collection process involved the utilization of a Google form, where the participants were obligated to submit their informed consent prior to their involvement in the study. Only individuals who provided voluntary consent were considered for participation. An online link which was generated through Google Forms, was formed and disseminated to the study participants for the purpose of accessing the survey instrument through different social media platforms. The survey was made accessible to the target population for a specific period, during which participants were encouraged to respond to the questionnaire. This approach allowed for data collection from a diverse group of stakeholders involved in the CI in Riyadh. Upon completion of the data

collection phase, the obtained survey responses were compiled and organized for further analysis (Taherdoost, 2019).

The data were carefully checked for completeness and accuracy before being subjected to statistical analysis using appropriate software such as SPSS. The responses were treated with confidentiality, ensuring the anonymity of the participants throughout the analysis process. Subsequently, various statistical techniques, including descriptive statistics, correlation analysis, and regression analysis, were applied to examine the relationships between SE and sustainable construction project delivery. The findings from the data analysis were then interpreted and presented in a comprehensive manner, allowing for the formulation of conclusions and implications for the study (Pallant, 2021).

3.6. Data Analysis

Statistical software, such as SPSS and MS Excel, was utilized to analyze the gathered data. The statistical software SPSS was employed for the purpose of data analysis, employing a variety of techniques. The software application Microsoft Excel was used to perform data coding and cleaning procedures, with the aim of converting the data from a qualitative format to a quantitative format. The process of data coding facilitated the transformation of subjective data into a quantifiable format that was easier to comprehend. The process of data cleaning involved the elimination of extraneous data and variances from the acquired dataset. Cronbach's alpha was utilized to assess the internal consistency of the data, gauging the extent to which the variables aligned with the underlying construct (Pallant, 2021). The utilization of multivariate analysis techniques was implemented to decrease the magnitude and dimensions of the dataset. The application of summary statistics facilitated the transformation of the data, whereas correlation and regression analysis were employed to evaluate the association and influence between the independent and dependent variables. In addition, regression analysis was performed to find the impact of the independent variable on the dependent variable.

At the same time, correlation analysis was performed to find the association and relationship between the dependent variable and the independent variable (Abulela & Harwell, 2020).

3.7. Research Validation

The survey had a thorough examination of its validity during the development process to ascertain its ability to accurately measure the intended constructs while upholding clarity and objectivity in its questioning. Prior to distributing the survey to the participants of the study, the researchers sought validation from experts in the field to identify and address any potential shortcomings, such as ambiguous inquiries or unsuitable formatting. A committee comprising three scholarly experts was enlisted to evaluate the survey and offer valuable insights. The survey's design was carefully examined by the esteemed professors to ensure its alignment with the study's objectives and inclusion of the pertinent variables. The perceptive feedback provided by individuals contributed to the refinement of the questionnaire, resulting in improvements to its validity and overall quality. The survey's credibility and accuracy were significantly enhanced by the valuable recommendations provided by academic experts. Through the implementation of a comprehensive validation procedure, the survey engendered a sense of assurance in the research findings, as it proficiently assessed the targeted constructs and upheld a state of impartiality. The comprehensive validation process employed in this study enhanced the overall strength and reliability of the research outcomes, thereby bolstering the credibility of the findings. Consequently, this study has made a significant and valuable contribution to the field of sustainable construction project delivery in Riyadh (Orpana et al., 2019).

3.8. Ethical Considerations

This study incorporated a comprehensive examination of ethical considerations to protect the rights and assistance of the participants and maintain the research process's integrity. All participants provided

informed consent, indicating their comprehensive understanding of the study's objectives, methodologies, and potential hazards prior to their voluntary participation. The participants were provided with explicit assurance regarding their entitlement to voluntarily withdraw from the study at any given time without encountering any negative repercussions. The maintenance of confidentiality was rigorously upheld to safeguard the identities and sensitive information of the participants. The data that was gathered underwent anonymization procedures, ensuring that individual respondents could not be identified. Only aggregated findings were subsequently reported to maintain respondent confidentiality. The study followed the principles of voluntary participation, guaranteeing that no participant was subjected to coercion or compulsion to partake in the research. The participation of individuals in the study was completely voluntary, and they were given the freedom to decline or withdraw from the study without experiencing any form of coercion. Furthermore, the investigation was carried out with the highest level of integrity and transparency, adhering to ethical standards and guidelines established in the field of research. The reported findings were presented with accuracy, and any possible conflicts of interest were duly disclosed. Throughout the course of the research endeavor, utmost consideration was given to the welfare and entitlements of the participants. The study was conducted with careful attention to ethical considerations, which ensured that it was carried out in an ethical and responsible manner. This approach aimed to maintain the trust and respect of the participants and enhance the credibility and validity of the research findings.

CHAPTER - IV

RESULTS

This research work is related to examining the impact of SE on sustainable construction projects in Riyadh. This research work is centered on the primary data method approach, and data was gathered through an online survey approach. In addition, data was collected from 284 stakeholders directly involved and related to sustainable construction projects. This study utilized the simple random sampling approach, and data were analyzed through SPSS and MS Excel. This two statistical software were utilized for the analysis of the collected data by employing several statistical tests, including descriptive analysis, principal component analysis, Cronbach alpha tests, regression analysis, and correlation analysis. The observed variables have been utilized to measure the latent variable of this research, such as 8 observed variables used to measure the latent variable of sustainable construction projects 7 used to measure the Stakeholder Engagement. Data has been assessed through IBM SPSS-27 and the results of the analysis have been discussed in this chapter.

4.1. Frequency and Percentage Analysis

4.1.1 Demographic Analysis

The results of the demographic analysis are stated below, obtained with the help of frequency and percentage analysis by using MS- Excel 16.

Table 1: Age of Participants					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	25-34 Years	167	58.8	58.8	59.2
	35-44 Years	62	21.9	21.9	80.7
	45-54 Years	35	12.3	12.3	93.0
	Below 25 Years	20	7.0	7.0	100.0

Total	284	100.0	100.0
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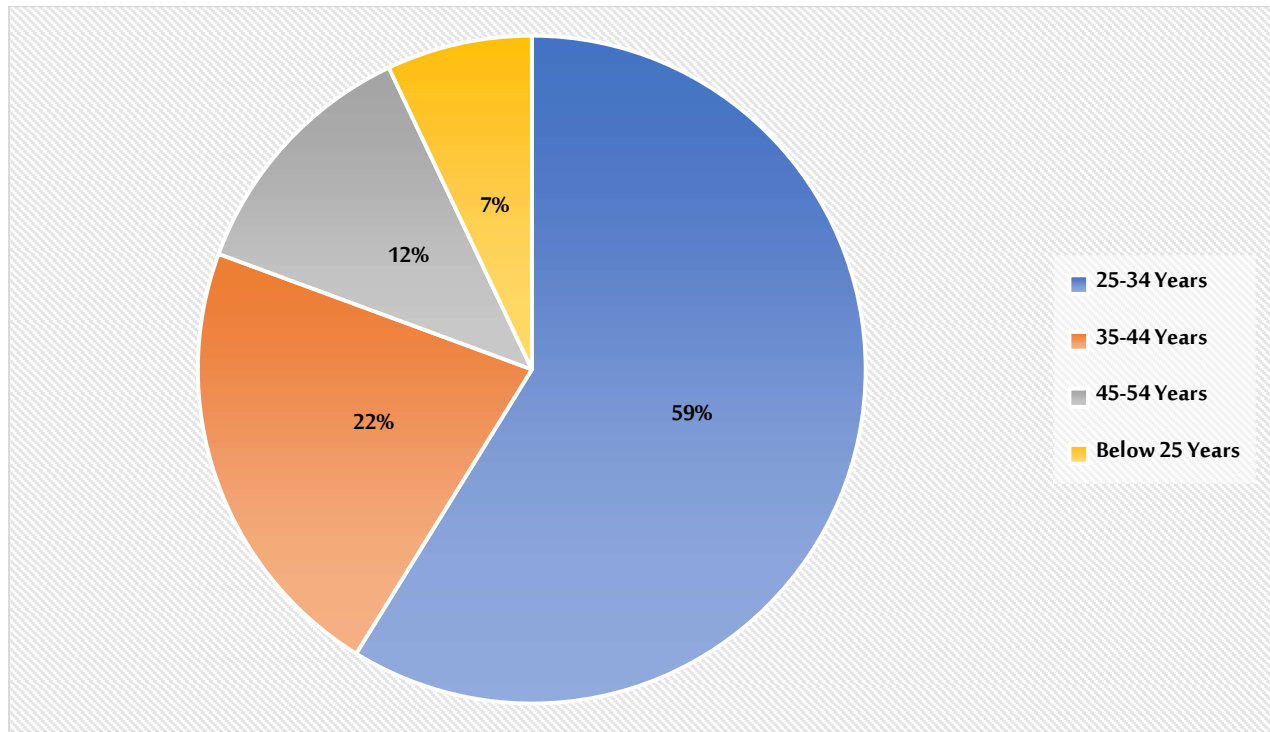


Figure 2: Age of Participants

Table 1 presents the distribution of participants' ages in the study on SE in sustainable construction project delivery in Riyadh. The table reveals that 59% of participants fell within the age range of 25-34 years, 22% of Participants aged between 35 and 44 years, and 12% aged 45-54 years constituted 35 participants. Additionally, 7% of participants were below the age of 25 years.

Table 2: Gender of Participants					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	57	20.1	20.1	20.1
	Male	227	79.9	79.9	100.0
	Total	284	100.0	100.0	

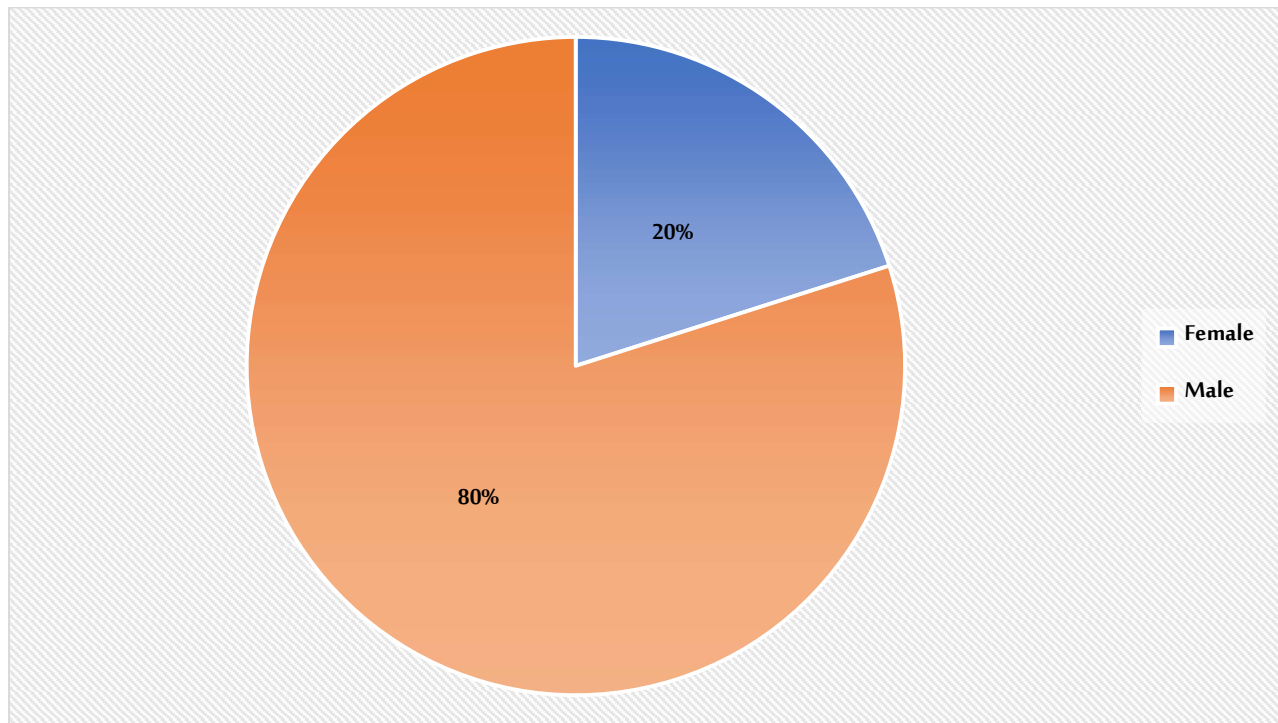


Figure 3: Gender of Participants

Table 2 displays the gender distribution of participants in the study on SE in sustainable construction project delivery in Riyadh. The table indicates that 80% of the participants were male, with a frequency of 227 individuals. On the other hand, there were 20% female participants. The table reveals a higher representation of males in the study compared to females.

Table 3: Professional Background of Participants

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Architecture	44	15.5	15.5	15.5
	Construction Worker	53	18.7	18.7	34.2
	Engineering (Civil/Structural/Mechanical/Electrical)	72	25.4	25.4	59.5
	Other	15	5.3	5.3	64.8
	Project Management	100	35.2	35.2	100.0

Total	284	100.0	100.0
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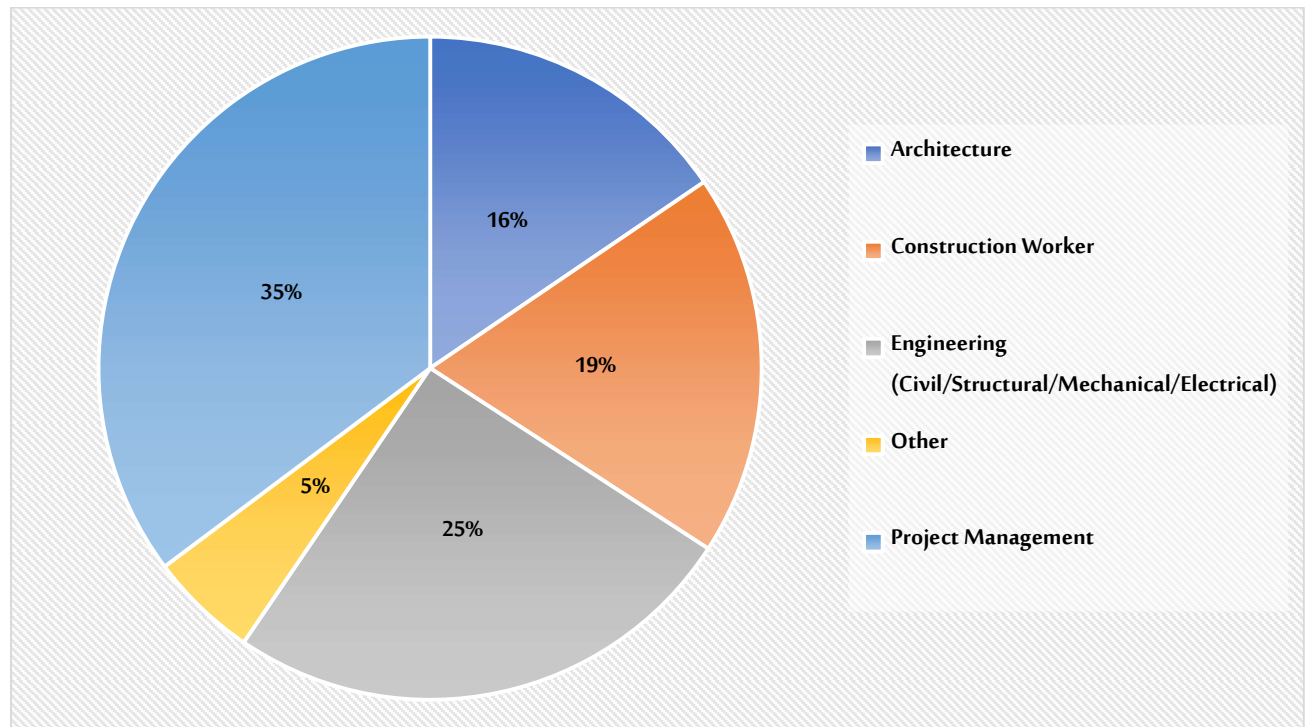


Figure 4: Professional Background of Participants

Table 3 presents the professional backgrounds of participants in the study on SE in sustainable construction project delivery in Riyadh. The table reveals the frequencies of participants in different professional categories. Among the participants, 25% of individuals belonged to various engineering fields, including civil, structural, mechanical, and electrical engineering. The category of project management had 35% of participants, while architecture was represented by 16% of individuals. Construction workers accounted for 19% of participants, and 5% of respondents fell into the "Other" category, which likely includes diverse professions related to the CI.

Table 4: Level of Experience of Participants in the CI

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	11-20 Years	76	26.8	26.8	26.8

25-10 Years	139	48.9	48.9	75.7
Less than 5 Years	35	12.3	12.3	88.0
More than 20 Years	34	12.0	12.0	100.0
Total	284	100.0	100.0	

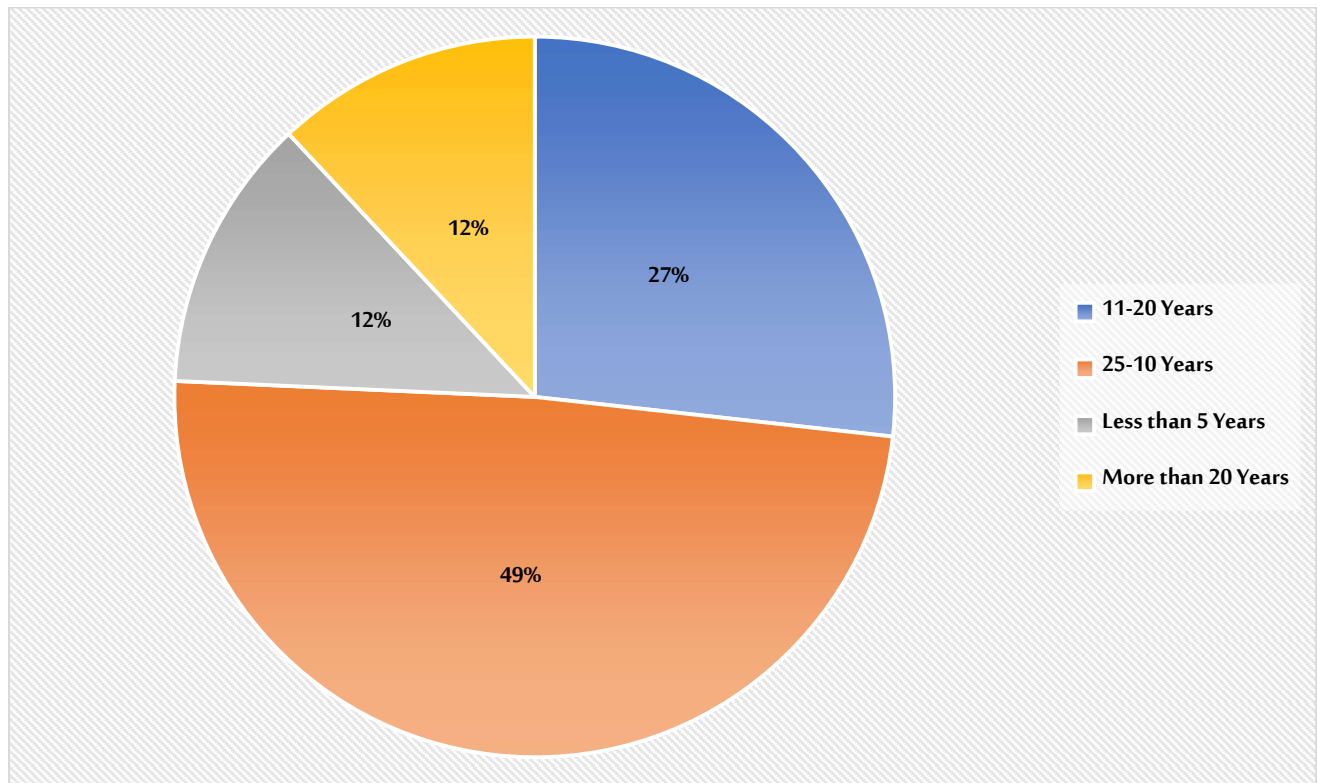


Figure 5: Level of Experience of Participants in the CI

Table 4 illustrates the distribution of participants' level of experience in the CI for the study on SE in sustainable construction project delivery in Riyadh. The table indicates that 27% of participants had been in the industry for 11-20 years. A significant number of participants, totaling 49%, had experience ranging from 25 to 10 years. Additionally, 12% of participants had less than 5 years of experience, while 12% of participants had amassed more than 20 years of experience in the construction sector.

Table 5: Type of Projects Respondents Mostly Worked On				
	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Commercial	56	19.7	19.7	19.7
	Industrial	18	6.3	6.3	26.1
	Infrastructure	181	63.7	63.7	89.8
	Others	16	5.6	5.6	95.4
	Residential	13	4.6	4.6	100.0
	Total	284	100.0	100.0	

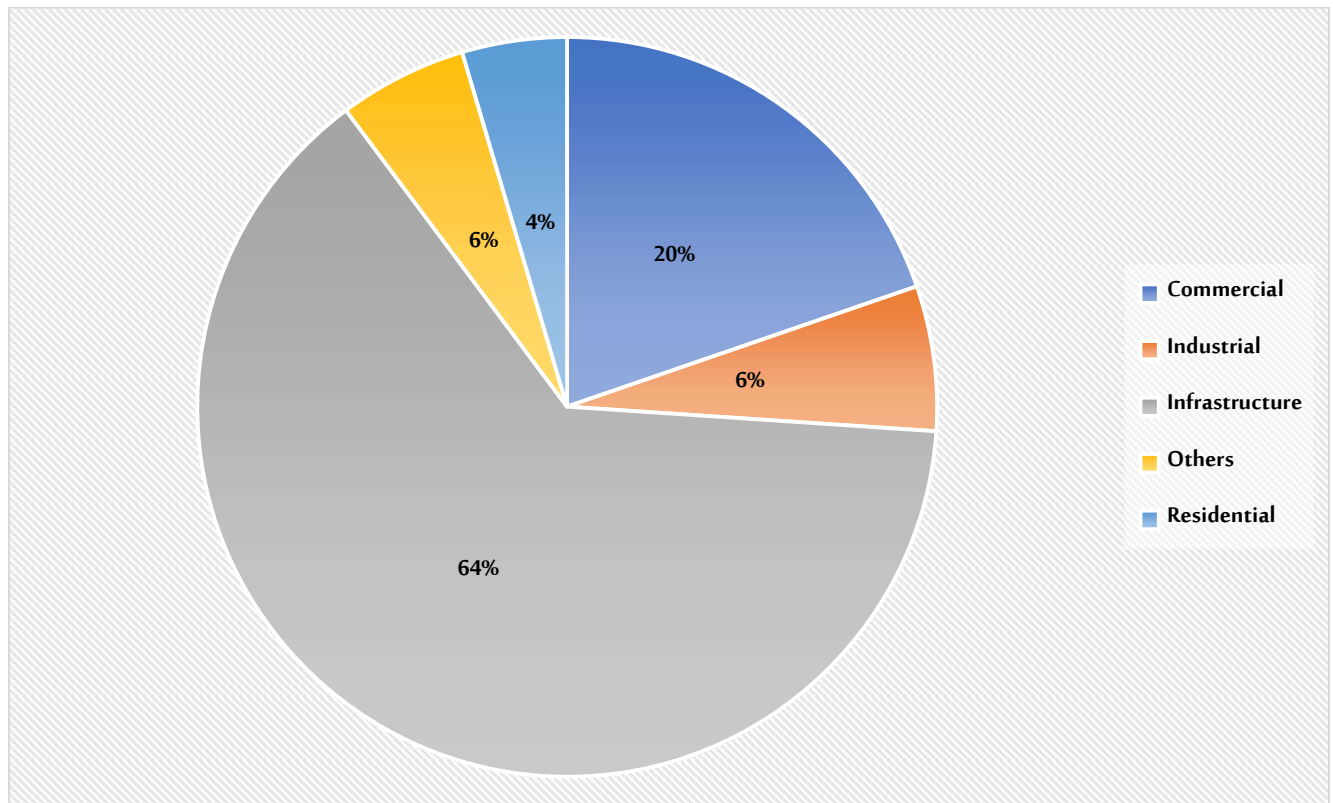


Figure 6: Type of Projects Respondents Mostly Worked On

Table 5 presents the distribution of the type of projects that respondents mostly worked on in the study on SE in sustainable construction project delivery in Riyadh. The table indicates that 64% of participants (181 individuals) primarily worked on infrastructure projects. Commercial projects were the next most common type, with 20% of respondents indicating their involvement. Industrial projects accounted for 6% of participants, while residential projects had 4% of respondents. Additionally, 6% of participants worked on

projects classified as "Others," which likely includes a diverse range of project types not explicitly mentioned in the given categories.

4.1.2 Frequency and Percentage Analysis of SE

Table 6: Frequency and Percentage Analysis of Stakeholder Engagement

	Clear and regular communication with stakeholders significantly improves project sustainability.	SE is crucial for successful delivery of a sustainable construction project.	Early involvement of stakeholders leads to better sustainability outcomes.	Stakeholders have a profound influence on the sustainability of construction projects.	There is a robust process in place to engage with all relevant stakeholders.	Stakeholders are actively involved in decision-making processes related to sustainability.	Stakeholder satisfaction is a key indicator of the successful delivery of sustainable construction projects.
Strongly Disagree	7	9	6	8	7	5	5
Disagree	6	4	25	12	5	4	62
Neutral	50	51	14	67	107	96	104
Agree	213	213	167	124	160	123	66
Strongly Agree	8	7	72	73	5	56	47

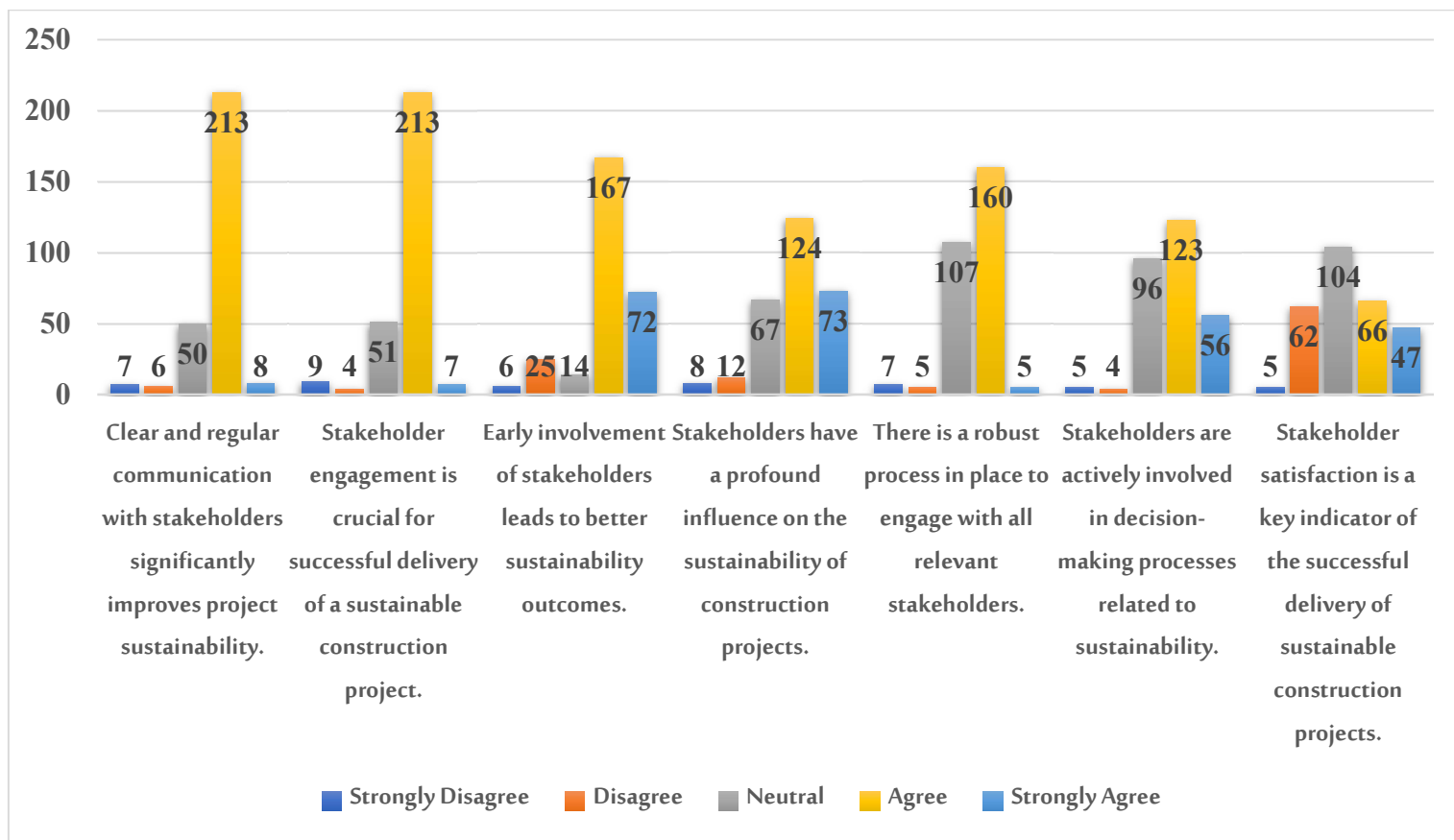


Figure 7: Frequency and Percentage Analysis of Stakeholder Engagement

The combined number of participants who either agree or strongly agree with the statements indicates a positive consensus on the importance of SE for successful sustainable construction project delivery. Across the statements, a substantial number of participants expressed agreement, highlighting the significance of clear and regular communication with stakeholders (221), SE for project success (426), and early stakeholder involvement leading to better sustainability outcomes (294). Moreover, stakeholders' profound influence on project sustainability was acknowledged by a significant number of participants (197). Additionally, a robust process for engaging with stakeholders (278) and their active involvement in decision-making related to sustainability (179) was well-recognized. Furthermore, the emphasis on stakeholder satisfaction as a key

indicator of successful project delivery was evident (103). Overall, the high number of agree and strongly agree responses underscores the crucial role of SE in achieving sustainable construction project goals.

4.1.3. Frequency and Percentage Analysis of Sustainable Construction Project Delivery

Table 7: Frequency and Percentage Analysis of Sustainable Construction Project Delivery

	Sustainable materials are a priority in the construction projects I have been involved with.	Energy-efficient practices are consistently implemented in our construction projects.	Water-saving measures are a key component of the project planning and implementation.	Waste minimization strategies are rigorously followed in construction projects.	We consider the long-term environmental impact during the project delivery process.	We aim for minimal disruption to local communities during construction.	Economic feasibility is carefully considered along with environmental sustainability.	Our construction practices contribute to social well-being and development in the long term.
Strongly Disagree	8	9	10	5	6	8	8	4
Disagree	12	33	33	8	4	4	6	8
Neutral	44	62	13	42	55	54	54	52
Agree	214	61	57	165	211	210	208	164
Strongly Agree	6	119	171	64	8	8	8	56

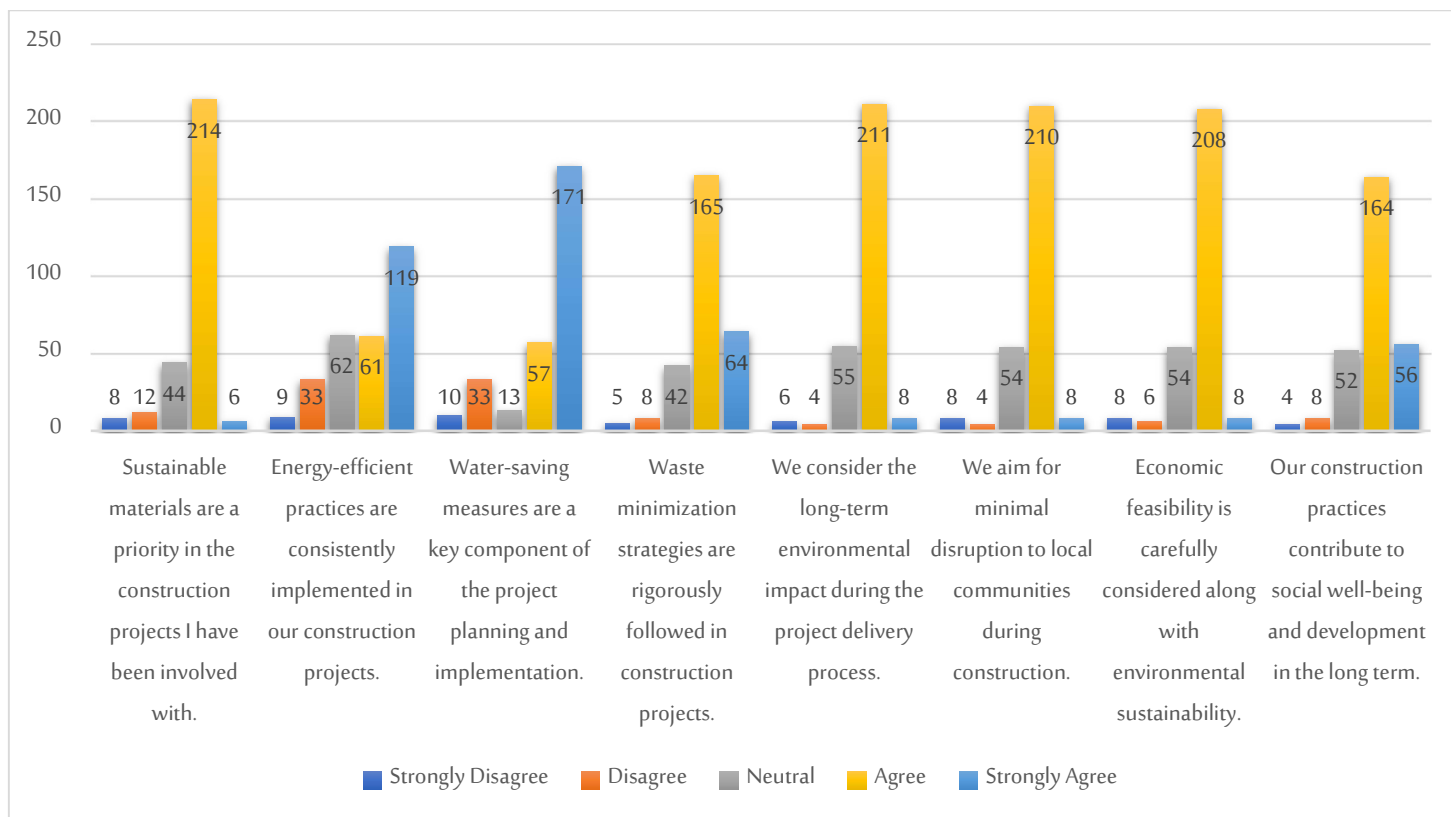


Figure 8: Frequency and Percentage Analysis of Sustainable Construction Project Delivery

The total number of participants who either agree or strongly agree with the statements indicates a positive inclination towards sustainable practices in construction projects. Among the statements, a considerable number of participants expressed agreement with the priority given to sustainable materials (275) and the consistent implementation of energy-efficient practices (180). Additionally, many participants agreed that water-saving measures (228) and waste minimization strategies (229) were key components of project planning and implementation. Moreover, a significant number of participants recognized the consideration of long-term environmental impact (172) and minimal disruption to local communities during construction (218). Furthermore, participants acknowledged the careful consideration of economic feasibility along with environmental sustainability (210). Finally, a substantial number of participants agreed that their construction practices contribute to social well-being and development in the long term (184). Overall, the high number of

agree and strongly agree responses reflects a positive attitude towards incorporating sustainable practices in construction projects.

4.2. Results of Descriptive Statistics

Table 8: Descriptive Statistics of Stakeholder Engagement

	N	Minimum	Maximum	Mean	Std. Deviation
Item 1	284	1	5	3.74	.665
Item 2	284	1	5	3.73	.667
Item 3	284	1	5	3.96	.920
Item 4	284	1	5	3.85	.947
Item 5	284	1	5	3.53	.685
Item 6	284	1	5	3.78	.839
Item 7	284	1	5	3.31	1.044
Valid N (Listwise)	284				

The descriptive statistics of the SE variables illustrate that most of the research participants agree with the statements mentioned above because the value of the mean is highly close to the five values, which shows that the option of agreeing has appeared and is marked more than other given options. At the same time, the value of the standard deviation shows that the data is scattered from the value of the mean.

Table 8: Descriptive Statistics of Sustainable Construction Project Delivery

	N	Minimum	Maximum	Mean	Std. Deviation
Item 1	284	1	5	3.70	.713
Item 2	284	1	5	3.87	1.173
Item 3	284	1	5	4.23	1.164
Item 4	284	1	5	3.97	.804
Item 5	284	1	5	3.74	.635
Item 6	284	1	5	3.73	.674
Item 7	284	1	5	3.72	.671
Item 8	284	1	5	3.92	.784
Valid N (Listwise)	284				

The descriptive statistics of the sustainable construction project delivery variables illustrate that most of the research participants agree with the statements mentioned above because the value of the mean is highly close to the five values, which shows that the option of agreeing has appeared and is marked more than other given options. At the same time, the value of the standard deviation shows that the data is scattered from the value of the mean.

4.3. Extraction of Latent Variables

4.3.1 Extraction of Stakeholder Engagement

Table 9: Reliability Statistics of Stakeholder Engagement	
Cronbach's Alpha	N of Items
.883	7

Table 9 displays the reliability statistics of SE based on Cronbach's alpha, with data collected from 7 items related to SE in the study on sustainable construction project delivery in Riyadh. The table shows a high Cronbach's alpha value of .883, indicating a strong level of internal consistency among the items measuring stakeholder engagement. A Cronbach's alpha value above .7 is generally considered acceptable for research instruments, and in this case, the value of .883 suggests that the items in the SE scale are reliable and consistent in measuring the construct.

Table 10: Total Variance Explained (Stakeholder Engagement)						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.659	37.983	37.983	2.659	37.983	37.983
2	1.625	23.219	61.201			
3	.988	14.120	75.322			

4	.778	11.118	86.440
5	.452	6.457	92.897
6	.284	4.052	96.950
7	.214	3.050	100.000
Extraction Method: Principal Component Analysis.			

Table 10 presents the total variance explained for SE based on Principal Component Analysis (PCA) with data from the study on sustainable construction project delivery in Riyadh. The table displays the initial eigenvalues, which represent the amount of variance associated with each component, and the extraction sums of squared loadings. The first component accounts for 37.983% of the total variance, making it the most influential in explaining stakeholder engagement. The subsequent components contribute to decreasing percentages of variance. Together, the first four components explain 86.440% of the total variance, while the remaining components add less to the overall variance. The PCA results indicate that the first component plays a crucial role in explaining the variation in stakeholder engagement, followed by diminishing contributions from the subsequent components.

Table 11: Component Matrix (Stakeholder Engagement)	
	Component
	1
Item 1	.793
Item 2	.775
Item 3	.719
Item 4	.620
Item 5	.341
Item 6	.556
Item 7	.320
Extraction Method: Principal Component Analysis.	
a. 1 Component Extracted (Stakeholder Engagement)	

Table 11 displays the component matrix for SE based on Principal Component Analysis (PCA) with data from the study on sustainable construction project delivery in Riyadh. The table shows the factor loadings for each item on the extracted component. The first component, which was extracted, explains the highest percentage of variance in stakeholder engagement. The factor loadings indicate the strength and direction of each item's relationship with the extracted component. Item 1 has a strong positive loading of .793 on the first component, indicating a significant contribution to stakeholder engagement. Similarly, Item 2 and Item 3 also have strong positive loadings of .775 and .719, respectively, reflecting their substantial influence on stakeholder engagement. Item 4 and Item 6 have positive loadings of .620 and .556, respectively, indicating moderate contributions to stakeholder engagement. Item 5 and Item 7 have relatively lower positive loadings of .341 and .320, respectively, suggesting a weaker association with the extracted component.

4.3.2. Extraction of Sustainable Construction Project Delivery

Table 12: Reliability Statistics (Sustainable Construction Project Delivery)	
Cronbach's Alpha	N of Items
.811	8

Table 12 displays the reliability statistics of sustainable construction project delivery based on Cronbach's alpha, with data collected from 8 items related to sustainable construction project delivery in the study on sustainable construction project delivery in Riyadh. The table shows a high Cronbach's alpha value of .811, indicating a strong level of internal consistency among the items measuring sustainable construction project delivery. A Cronbach's alpha value above .7 is generally considered acceptable for research instruments,

and in this case, the value of .811 suggests that the items in the SE scale are reliable and consistent in measuring the construct.

Table 13: Total Variance Explained (Sustainable Construction Project Delivery)

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.569	44.610	44.610	3.569	44.610	44.610
2	1.432	17.901	62.511			
3	1.011	12.642	75.153			
4	.839	10.486	85.638			
5	.546	6.820	92.458			
6	.263	3.292	95.750			
7	.221	2.763	98.513			
8	.119	1.487	100.000			
Extraction Method: Principal Component Analysis.						

Table 13 presents the total variance explained for sustainable construction project delivery based on Principal Component Analysis (PCA). The table displays the initial eigenvalues, representing the amount of variance associated with each component, and the extraction sums of squared loadings. The first component explains 44.610% of the total variance, making it the most significant contributor to explaining sustainable construction project delivery. The subsequent components account for decreasing percentages of variance, with the first four components explaining 85.638% of the total variance. The PCA results indicate that the first component plays a critical role in explaining the variation in sustainable construction project delivery, followed by diminishing contributions from the subsequent components.

Table 14: Component Matrix (Sustainable Construction Project Delivery)

	Component
--	-----------

	1
Item 1	.466
Item 2	.715
Item 3	.785
Item 4	.618
Item 5	.578
Item 6	.767
Item 7	.737
Item 8	.616
Extraction Method: Principal Component Analysis.	
a. 1 Components Extracted. (Sustainable Construction Project Delivery)	

Table 14 displays the component matrix for sustainable construction project delivery based on Principal Component Analysis (PCA). The table presents the factor loadings for each item on the extracted component. The first component, which was extracted, explains the highest percentage of variance in sustainable construction project delivery. The factor loadings indicate the strength and direction of each item's relationship with the extracted component. Item 3 has the highest positive loading of .785 on the first component, indicating a significant contribution to sustainable construction project delivery. Similarly, Item 6 and Item 7 also have strong positive loadings of .767 and .737, respectively, reflecting their substantial influence on project delivery. Item 2 and Item 8 have positive loadings of .715 and .616, respectively, indicating moderate contributions to sustainable construction project delivery. Item 4 and Item 5 also have positive loadings of .618 and .578, respectively, suggesting their relevance to the extracted component. Item 1 has a positive loading of .466, indicating a weaker association with the extracted component compared to the other items.

4.4. Results of Correlation Analysis

Table 15: Results of Correlation Analysis

			Stakeholder Engagement	Sustainable Construction Project Delivery	
Stakeholder Engagement			Pearson Correlation	1	.775**
			Sig. (2-tailed)		.000
			N	284	284
Sustainable Delivery	Construction	Project	Pearson Correlation	.775**	1
			Sig. (2-tailed)	.000	
			N	284	284
**. Correlation is significant at the 0.01 level (2-tailed).					

Table 15 presents the results of correlation analysis between SE and sustainable construction project delivery based on data from 284 participants in the study. The table displays the Pearson correlation coefficients and their significance levels (Sig. - 2-tailed) for the two variables. The correlation coefficient between SE and sustainable construction project delivery is 0.775, and the correlation is highly significant at the 0.01 level (2-tailed). This indicates a strong positive relationship between SE and the successful delivery of sustainable construction projects. The correlation coefficient of 0.775 suggests that as SE increases, the level of successful project delivery in terms of sustainability also increases. The result highlights the importance of active involvement and effective communication with stakeholders in achieving better outcomes in sustainable construction projects. This finding reinforces the significance of engaging stakeholders throughout the project lifecycle to enhance project success and promote sustainable practices in the CI.

4.5. Results of Regression Analysis

Table 16: Results of ANOVA Test						
		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	64.671	1	64.671	81.533	.000
	Residual	222.093	283	.793		
	Total	286.764	284			

a. Dependent Variable: Sustainable Construction Project Delivery

b. Predictors: (Constant), Stakeholder Engagement

The results show that the Regression sum of squares is 64.671, with 1 degree of freedom, and the Residual sum of squares is 222.093, with 283 degrees of freedom. The Mean Square for Regression is 64.671, while the Mean Square for residuals is 0.793. The F-statistic is 81.533, indicating a highly significant relationship between SE and sustainable construction project delivery (Sig. = 0.000, $p < 0.01$). Overall, the ANOVA test confirms that SE significantly influences the successful delivery of sustainable construction projects. The results provide statistical evidence to support the positive relationship between SE and project success in terms of sustainability.

Table 17: Results of Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.003	.053		-.055	.956
	Stakeholder Engagement	.480	.053	.475	9.030	.000

a. Dependent Variable: Sustainable Construction Project Delivery

Table 17 presents the results of the regression analysis conducted to investigate the relationship between SE (independent variable) and sustainable construction project delivery (dependent variable) based on data from the study. The regression model shows two coefficients: the constant term and the coefficient for stakeholder engagement. The constant term is not statistically significant in predicting sustainable construction project delivery, as evidenced by its small coefficient (.003) and non-significant p-value (.956). However, the coefficient for SE is highly significant, with a value of .480 and a standardized coefficient (Beta) of .475. The positive Beta indicates that SE has a meaningful positive effect on sustainable construction project delivery. The associated t-value of 9.030 and p-value of .000 (significant at the 0.01 level) further support the statistically

significant relationship between SE and project delivery. These findings highlight the crucial role of SE in promoting successful and sustainable construction projects.

All the hypothesis of this research work has been accepted based on the results of the correlation and regression analysis.

H₁: Effective SE practices are positively associated with the level of implementation of Sustainable construction practices in projects in Riyadh.

H₂: Higher levels of SE led to improved sustainability outcomes in construction projects in Riyadh.

H₃: There is a positive relationship between SE and stakeholder satisfaction in Sustainable construction projects in Riyadh.

CHAPTER-V

DISCUSSION

5.1. Discussion

The present study investigated the Influence of SE on Sustainable Construction Project Delivery in Riyadh. Through a comprehensive analysis of data collected from 284 participants, the major findings shed light on the significant role of SE in promoting sustainable construction project delivery in Riyadh. The study revealed a strong positive correlation ($r = 0.775$) between SE and sustainable construction project delivery. This finding underscores the importance of actively involving stakeholders throughout the project lifecycle to achieve better sustainability outcomes. When stakeholders are engaged effectively, it fosters a collaborative approach, leading to more successful project delivery in terms of environmental, social, and economic sustainability.

Moreover, the regression analysis provided compelling evidence of the critical influence of SE on sustainable project delivery. The regression coefficient for SE ($B = 0.480$) demonstrated that higher levels of SE significantly contribute to improved project delivery in terms of sustainability. The standardized coefficient ($Beta = 0.475$) further emphasizes the substantial impact of SE on the dependent variable. This finding emphasizes the pivotal role of stakeholders in shaping the success and sustainability of construction projects in Riyadh. Additionally, the principal component analysis (PCA) identified key components contributing to SE and sustainable construction project delivery. The first component explained 44.610% of the variance in sustainable project delivery, highlighting its central role in influencing the outcomes. The high percentage of variance explained by the first component indicates that SE strongly affects the overall success of sustainable construction projects in Riyadh.

Furthermore, the descriptive statistics provided valuable insights into the participants' perspectives on SE and sustainable project delivery. The mean ratings for SE items were consistently above the neutral point, indicating a positive attitude towards engagement practices. Similarly, the mean ratings for sustainable construction project delivery items were relatively high, suggesting a favourable perception of the project outcomes in terms of sustainability. These findings indicate that stakeholders recognize the significance of their involvement in achieving sustainable project goals.

The findings of this research work are supported by the previous studies, as the study by Han et al. (2019) found that higher levels of SE positively influenced the success of sustainable construction projects by fostering collaboration and aligning project goals with stakeholder interests. In addition, Shaukat et al. (2021) reported a strong correlation between SE and improved project outcomes in terms of sustainability, emphasizing the role of effective communication and collaboration in achieving sustainable development goals. Likewise, Chen et al. (2017) identified SE as a critical factor in enhancing the long-term environmental performance of construction projects, leading to reduced environmental impacts and resource consumption.

Correspondingly, Hwang (2013) highlighted the positive influence of SE on project success and emphasized the need for stakeholders' participation in decision-making to achieve sustainable construction outcomes. Similarly, Bal et al. (2013) conducted a study and confirmed that SE significantly contributed to sustainable construction project success across various geographic regions and project types. In addition, Cundy et al. (2013) examined the relationship between SE and social sustainability in construction projects and found that active stakeholder involvement positively impacted social prosperity and community well-being.

Additionally, Eskerod & Huemann (2013) reported that collaborative stakeholder interactions resulted in cost savings and enhanced project efficiency. Harris et al. (2021) revealed that projects with higher levels of SE had better compliance with environmental regulations and demonstrated a stronger commitment to

sustainable practices. The study by Heravi et al., 2015) identified that close collaboration with suppliers and contractors led to improved environmental performance and resource efficiency. Park et al. (2018) explored the influence of SE on the integration of renewable energy technologies in construction projects and concluded that engaged stakeholders were more receptive to adopting sustainable energy solutions.

Furthermore, Lambrechts et al. (2019) found that a participatory approach to safety planning resulted in fewer accidents and increased worker well-being and observed that engaged stakeholders contributed to innovative solutions that enhanced project sustainability. Alves, et al. (2021) examined the influence of SE on the resilience of construction projects to climate change impacts, demonstrating that proactive stakeholder involvement improved project adaptability and robustness. Allen & Iano (2019) revealed that engaged stakeholders contributed to better risk identification and mitigation, reducing project vulnerabilities. Furthermore, Yang & Zou (2014) highlighted SE as a critical driver for sustainable practices in the CI, calling for increased awareness and commitment to stakeholder involvement for long-term success.

These previous studies consistently support the findings of the present study, emphasizing the significant positive impact of SE on sustainable construction project delivery. The collective evidence underscores the importance of fostering collaborative and inclusive stakeholder involvement to achieve sustainable development goals in the CI.

5.2 Conclusion

This research work aimed to find the impact of SE on sustainable construction project delivery in Riyadh. The present study adopted a quantitative methodology and employed a descriptive research design. The target population for this research included key stakeholders involved in the CI within Riyadh. These stakeholders comprised project clients, contractors, architects, project managers, construction workers, suppliers, local communities, and relevant government authorities involved in the construction approval

process. For this study, approximately 284 participants were selected, proportionally distributed among the different stakeholder groups. The sampling methodology utilized in this study was simple random sampling, which is a fundamental and extensively employed technique in quantitative research. To achieve a comprehensive and unbiased sample from the specific population of stakeholders engaged in the CI in Riyadh, this approach provided an equitable chance for every individual within the population to be chosen for inclusion. The present study utilized primary data analysis, with an online survey serving as the chosen method for data collection. The target population was surveyed using a self-constructed questionnaire, which was developed after a comprehensive review of pertinent literature. An online link which was generated through Google Forms, was formed, and disseminated to the study participants for the purpose of accessing the survey instrument through different social media platforms. The data were carefully checked for completeness and accuracy before being subjected to statistical analysis using appropriate software such as SPSS and were analyzed by employing statistical tests through MS Excel and SPSS. The study revealed a strong positive correlation ($r = 0.775$) between SE and sustainable construction project delivery. This finding underscores the importance of actively involving stakeholders throughout the project lifecycle to achieve better sustainability outcomes. When stakeholders are engaged effectively, it fosters a collaborative approach, leading to more successful project delivery in terms of environmental, social, and economic sustainability. Moreover, the regression analysis provided compelling evidence of the critical influence of SE on sustainable project delivery. The regression coefficient for SE ($B = 0.480$) demonstrated that higher levels of SE significantly contribute to improved project delivery in terms of sustainability. The standardized coefficient ($Beta = 0.475$) further emphasizes the substantial impact of SE on the dependent variable. This finding emphasizes the pivotal role of stakeholders in shaping the success and sustainability of construction projects in Riyadh.

5.3. Limitation and Scope for Future Research

This research work is limited to Riyadh, and the findings are not directly applicable to other regions due to differences in cultural, economic, and regulatory contexts. Moreover, the inferences drawn from the study are heavily contingent upon the viewpoints of the interviewed stakeholders, potentially resulting in subjective understandings of the pertinent issues. The narrow concentration on Riyadh may potentially restrict the generalizability of the findings to other regions characterized by varied contexts. To augment the broader applicability of our findings, it would be advantageous to broaden the geographical scope of the study to encompass multiple cities or even different countries. An additional factor to consider is the dependence on quantitative data, which undeniably provides valuable statistical insights. However, it is possible that the analysis failed to consider the complex intricacies of SE dynamics.

To gain a more thorough understanding of stakeholders' attitudes and perceptions, it would be beneficial to adopt a comprehensive approach that integrates qualitative research methods, such as interviews and focus groups. This would enhance the analysis by providing a more in-depth exploration of the subject matter. Furthermore, it is important to note that the study's cross-sectional design solely captures a momentary representation of SE practices within a designated period. To gain insights into the temporal dynamics and their impact on project outcomes, prospective researchers may consider employing longitudinal studies that monitor SE throughout the complete lifecycle of sustainable construction projects.

In addition, it is important to note that although the research primarily concentrated on individuals working in the CI and those directly involved in the projects, it is essential to acknowledge the significant influence of other key entities such as local communities, non-governmental organizations (NGOs), and regulatory bodies in shaping sustainable construction practices. It is recommended that future research endeavours adopt a more inclusive methodology, which entails incorporating a wide array of stakeholders'

viewpoints in order to achieve a comprehensive comprehension of the subject matter. The study focused primarily on examining the impact of SE on the delivery of sustainable construction projects. However, conducting research on the reciprocal association between sustainable construction practices and SE could provide a comprehensive viewpoint and ascertain the factors that either facilitate or impede successful engagement.

The study's findings provide significant insights into the engagement of stakeholders in the delivery of sustainable construction projects, which will be beneficial for future endeavours. To enhance the research landscape and address the identified limitations, several dynamic recommendations arise. It is imperative for researchers to adopt a comprehensive approach that integrates quantitative and qualitative methodologies to elucidate the complexities of stakeholder interactions and their influence on project outcomes. Through the process of triangulating data from multiple sources, it is possible to attain a comprehensive comprehension of the factors that influence stakeholder engagement, the obstacles that may arise, and the potential strategies that can be implemented to enhance its effectiveness.

The examination of the influence of policy and regulatory frameworks on SE is a crucial area of study. A comprehensive examination of current policies and their impact on the adoption of sustainable construction methods can reveal possible obstacles or motivations for increased engagement from stakeholders. The comprehension of this intricate interconnection will result in the development of constructive structures that foster proactive involvement. The significance of economic factors should not be disregarded, as they exert a crucial influence on the advancement of sustainable construction initiatives. It is recommended that future research endeavours undertake thorough cost-benefit analyses and investigate the enduring financial ramifications of sustainable practices. Illustrating the financial feasibility of involving stakeholders can act as a compelling incentive for their enthusiastic involvement.

It is recommended that the utilization of technology as a catalyst for change is imperative to effectively facilitate stakeholder engagement. The utilization of advanced technologies such as Building Information Modeling (BIM) and collaborative platforms have the potential to enhance communication efficiency and foster transparency among various stakeholders. The utilization of real-time information sharing, and data visualization has the potential to empower stakeholders, enabling them to actively engage in the decision-making process.

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APPENDIX – I

(QUESTIONNAIRE)

Topic: The Influence of Stakeholder Engagement on Sustainable Construction Project Delivery in

Riyadh

(Questionnaire)

Consent Statement

Dear Respondents, I would like to thank you for your cooperation and for allocating some of your precious time to fill out this questionnaire that was prepared for the purpose of research. I would highly appreciate it if you could take part in this survey. This questionnaire is short as it will take approximately only five minutes. We will not ask for your personal information, and your answers will be treated with complete confidentiality and will be entirely anonymous. The reliability of the research depends largely on the information provided by you as a participant. Thank you for giving the time to complete this questionnaire.

Demographics questions

1. What is your age group?

- Below 25
- 25-34
- 35-44
- 45-54
- Above 54

2. What is your gender?

- Male
- Female
- Prefer not to say

3. What is your professional background?

- Project Management
- Architecture
- Engineering (Civil/Structural/Mechanical/Electrical)
- Construction Worker
- Other

4. What is your level of experience in the construction industry?

- Less than 5 years
- 5-10 years
- 11-20 years
- More than 20 years

5. What type of projects have you mostly worked on?

- Residential
- Commercial
- Industrial
- Infrastructure
- Others (Please specify)

Stakeholder Engagement

1. Clear and regular communication with stakeholders significantly improves project sustainability.

1. Strongly Disagree
2. Disagree

3. Neutral
 4. Agree
 5. Strongly Agree
2. Stakeholder engagement is crucial for successful delivery of a sustainable construction project.
 1. Strongly Disagree
 2. Disagree
 3. Neutral
 4. Agree
 5. Strongly Agree
3. Early involvement of stakeholders leads to better sustainability outcomes.
 1. Strongly Disagree
 2. Disagree
 3. Neutral
 4. Agree
 5. Strongly Agree
4. Stakeholders have a profound influence on the sustainability of construction projects.
 1. Strongly Disagree
 2. Disagree
 3. Neutral
 4. Agree
 5. Strongly Agree
5. There is a robust process in place to identify and engage with all relevant stakeholders.
 1. Strongly Disagree
 2. Disagree
 3. Neutral
 4. Agree
 5. Strongly Agree

6. Stakeholders are actively involved in decision-making processes related to sustainability.
1. Strongly Disagree
 2. Disagree
 3. Neutral
 4. Agree
 5. Strongly Agree
7. Stakeholder satisfaction is a key indicator of the successful delivery of sustainable construction projects.
1. Strongly Disagree
 2. Disagree
 3. Neutral
 4. Agree
 5. Strongly Agree

Sustainable Construction Project Delivery

1. Sustainable materials are a priority in the construction projects I have been involved with.
1. Strongly Disagree
 2. Disagree
 3. Neutral
 4. Agree
 5. Strongly Agree
2. Energy-efficient practices are consistently implemented in our construction projects.
1. Strongly Disagree
 2. Disagree
 3. Neutral
 4. Agree
 5. Strongly Agree

3. Water-saving measures are a key component of the project planning and implementation.

1. Strongly Disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly Agree

4. Waste minimization strategies are rigorously followed in construction projects.

1. Strongly Disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly Agree

5. We consider the long-term environmental impact during the project delivery process.

1. Strongly Disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly Agree

6. We aim for minimal disruption to local communities during construction.

1. Strongly Disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly Agree

7. Economic feasibility is carefully considered along with environmental sustainability.

1. Strongly Disagree
2. Disagree
3. Neutral

4. Agree
 5. Strongly Agree
-
8. Our construction practices contribute to social well-being and development in the long term.
 1. Strongly Disagree
 2. Disagree
 3. Neutral
 4. Agree
 5. Strongly Agree

Thanks, Note

The fact that you are reading this message indicates that you have completed our questionnaire and that we owe you a debt of thanks. We are very appreciative of the time you have taken to assist in our analysis and commit to utilizing the information gained to contemplate and implement valuable improvements. We will share these results with you through your State Survey Agency, whom we also thank for their generous participation. Once again, we are extremely grateful for your helpful contribution, your honest information, and your thoughtful suggestions.