Review on Project Manager's Leadership Skills in the Pre-Construction Phase of Sustainable Construction Projects

Noorul Adharina Zulkiffli[1,*], *Aryani Ahmad Latiffi*[1]

[1,]Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia (UTHM)
86400 Parit Raja, Batu Pahat, Johor Malaysia

Abstract. Project managers have played a vital role in sustainable construction projects by integrating the concept of sustainability into their practices. The role of project manager is important in all phases of sustainable construction projects but especially in the pre-construction phase when the greatest challenges that require their involvement occur. This requires project managers to have effective leadership skills to think a project through and remain focused on the end goal. Thus, the aim of this paper is to identify the project manager's leadership skills in the pre-construction phase of sustainable construction projects. A key significant contribution of this paper is the literature review of journals and books on project manager's leadership skills when engaged in sustainable construction projects. The overall intent is to highlight and identify the leadership skills of project managers in the pre-construction phase of sustainable construction projects so that the values and benefits of these skills can be adapted in current practices to successfully deliver such projects.

1 Introduction

The need to achieve sustainability is duly highlighted as the term has become widespread in policy-oriented research as a target that public policies ought to achieve [1]. This makes it important to ensure that sustainability is included as part of a strategy that balances social development, economic growth, and environmental sustainability. In addition, the shift of the construction industry from its traditional practices towards sustainable development has received close global attention in the form of "sustainable construction" [2-3].

Sustainable construction is technically complex since it involves multi-disciplinary designers and engineers with green expertise along with multi-cultural (languages, nationality, and religion) project teams at several different levels. Alongside their traditional roles (time, scope, and cost), project managers can be sustainability drivers within the project teams. As the sustainable construction phenomenon continues to grow and gain popularity, thus, there is a need to improve pivotal attributes that project managers should possess in order to manage a sustainable construction project. Project managers face challenges in implementing green building particularly within the pre-construction phase [4-5] where they need to determine sustainable goals and establish a framework for future decision-making within all construction phases [4]. It is important that project managers can act as leaders to effectively and strategically manage sustainable construction projects. Therefore, this paper discusses and identifies the roles and the leadership skills of the project manager in sustainable construction projects, particularly within the pre-construction phase.

2 The life-cycle of sustainable construction projects

The sustainable construction life cycle is the process of building services which consist of design, construction, operational and maintenance, renovation, and demolition [6]. The elements of sustainability (environment, economic, and social) are also involved in this life cycle [7]. In addition to that, the activities involved are not only to build the structure using systems that are friendly to the environment but also to use resources efficiently throughout the life cycle of the building and the services required [8-9]. Figure 1 shows the building life cycle and six (6) major aspects of green building.

Based on Figure 1, the comprehensive processes of a building's life cycle generally embrace design, construction, operational and maintenance, renovation, and demolition [10-11]. However, according to Kubba, Wedding and Richard, a green building is a building that has been designed, constructed, and operated to be resource-efficient [12-14]. Green building includes several components such as energy efficiency, indoor environment quality, materials and resources, and sustainable site planning and management.

* Corresponding author: noorul.adharina@gmail.com

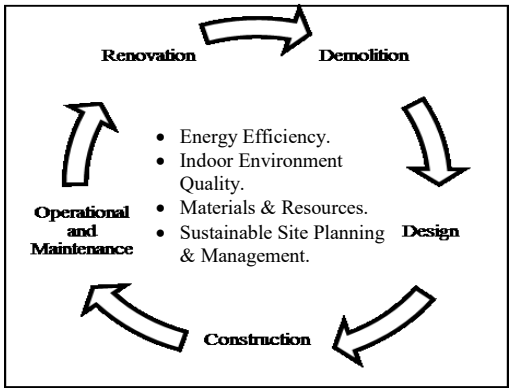

Fig. 1. Building life cycle and aspects for sustainable building [8; 11-16]

Meanwhile, Shi *et al.* indicate that green building includes energy efficiency and renewable energy, water efficiency, green building materials and specifications, waste reduction, reduced toxicity, indoor air quality and smart growth as well as sustainable development [15].

The sustainability approach in a building's life cycle is also a way of formulating the responsibility within the construction industry to protect the environment [8, 16-17]. Hence, these principles will form a framework to achieve sustainable building covering all sustainability issues (environment, economy, and social) during all stages of a building project [8, 16].

3. Role of the project manager in sustainable construction projects.

The success or failure of a project is influenced by the appointment of the project manager. Therefore, a successful project manager should perform various roles and responsibilities simultaneously and plays an important role in all phases of a sustainable construction project (the pre-construction, construction, and post-construction phases). Table 1 shows the role of the project manager in a sustainable construction project.

Table 1. Role of the project manager in a sustainable construction project [4; 18-22]

Activity	Role
Pre-Construction	• Setting sustainability goals. • Provide cost estimation for the project. • Develop schedules for the integrated project team.
Construction	• Consider the environmental impact of a project. • Control possible risk to avoid higher cost. • Control the supply chain.
Post-Construction	• Monitoring that all sustainability criteria have been fulfilled. • Provide building documentation for operation and maintenance to the client and end user.

During the pre-construction phase, the existence of the project manager becomes pivotal. This is because this phase is the most important step towards delivering a sustainable building [4]. The role of the project manager in the pre-construction phase of a sustainable construction project will be discussed below.

Considering environmental impacts, such as waste management and the reuse and recycling of construction material, are parts of the project manager's responsibility in the construction phase, Del Río Meriono *et al.* highlighted that a project manager should be alert to feasible cost saving by reducing waste along with environmental impacts [18]. Moreover, the role of project manager in controlling risk in the construction phase is important in order to avoid higher risk-related costs [19]. Managing risk efficiencies in a sustainable construction project is important for a project manager in order to avoid cost-overruns. Besides that, to avoid additional cost in the supply chain, controlling issues such as material delivery times and the quality of materials is important as recognized by Hills *et al.* [20].

Finally, during the post-construction phase, the project manager has an important role in ensuring the fulfillment of sustainability criteria and providing building documentation for commissioning and maintenance measurement to the client and end user [21]. After the completion of a green building, the project team can monitor building performance for future reference. Meanwhile, upon completion, feedback can be documented by the end user in subsequent years [22].

3.1 Role of the project manager in the pre-construction phase of sustainable construction projects.

Project managers can specifically play a vital role in sustainable construction projects by integrating the concept of sustainability into their practices. Particularly in the pre-construction phase, the roles and responsibilities of the project manager are noticeable in completely attaining sustainability objectives. Table 2 shows the roles of the project manager in the pre-construction phase of a sustainable construction project.

Table 2. The role of the project manager in the pre-construction phase of sustainable construction projects [4; 19; 23-26]

Activity	Role
Initial	• Identify stakeholders that could impact or be impacted by the decisions, activities, and outcomes of the project. • Documenting relevant stakeholder information regarding interests, involvement, influence, and potential impact on project success.
Planning	• Setting sustainability goals in a project. • Establish the policies, procedures, and controlling project costs within project phases.
Design	• Review green design concepts, final drawings and environmental specifications. • Coordinate design options so that they will deliver the project in line with stakeholder and/or client requirements that have been set.

Based on Table 2, the role of a project manager in the pre-construction phase involves the initial, planning, and design stages. In the initial stage, the necessity to identify the needs and interests of stakeholders is important since their understanding is more significant in sustainable construction because the goal is long-term and the benefits can seem vague [23]. The willingness to meet the client's needs can increase the chances of meeting the project goals even if the stakeholders fail to be convinced about the benefits of green building and do not feel the need to implement it [24]. The interest of the stakeholders can improve their understanding of different aspects of a sustainable construction project. Thus, a project manager has to convince the stakeholders about the concept of sustainability and the value of green building.

Moreover, in the planning stage, setting sustainability goals and controlling project costs within project periods is essential for sustainable construction projects. According to Hakinen and Belloni, lack of sufficient knowledge to develop a project concisely with clear goals is a barrier to sustainable construction [25]. However, Wu *et al.* indicate that controlling project costs is one of the most important factors affecting a project manager's decisions in a green project [26]. Therefore, the project manager needs to set clear sustainability goals during the planning stage in order to prevent any hindrance in other phases. Robichaud and Anantatmula suggest that setting sustainability goals during the planning stage can establish a framework for all future decision making [4]. Consequently, any changes or wrong decisions leading to cost inefficiency can be reduced.

Furthermore, at the design stage, the project manager is responsible as a coordinator to review the final design drawings in line with sustainability and stakeholder requirements. According to Jaworski and Samanta, the project manager should ensure that project goals are achieved and carefully monitored during the design stage to meet the project requirements [19]. This design stage involves a multi-disciplinary project team, making the role of the project manager even more vital. Besides that, the involvement of all the project team in the design process will avoid redesign problems [24].

Project managers are responsible for the daily management of the various activities in the sustainable construction process, including the management, technical, and legal aspects of the work. Thus, the roles of the project manager in the pre-construction phasehave a specific function in the implementation of a sustainable construction project.

4 Leadership in the construction industry.

The need for leadership in the construction industry is mainly because the success or failure of construction projects is highly dependent on who is leading and coordinating them. However, 80% of project failures are due to poor leadership, including inadequate leadership skills, lack of teamwork, inefficiency in problem-solving, and weaknesses in communication [27]. Added to that, most of the leadership challenges, particularly in the construction industry, relate to its workforce, including shortage of good-quality workers, an aging workforce, teamwork, communication, training, and education [28]. In addition, some failures in the construction industry have become the subject of continuous criticism especially its fragmentation and poor record on quality, waste, financial claims, safety, and efficiency [29]. For all of these failures, one of the causes is ineffective leadership.

Undoubtedly, the construction industry is large and technically complex and involves a combination of specific skills [30]. The leadership will be shared through teamwork, and the position of the leader in teams will rotate. Thus, the construction teams are not only large but also involve various disciplines and this makes leadership significant in the construction industry.

4.1 Leadership skills of the project manager in sustainable construction projects.

The literature includes several discussions of leadership skill; this soft skill continues to draw the attention of scholars investigating its contributions to the success of a project. Table 3 shows some publications related to the leadership skills of sustainable construction project managers.

Table 3. Publications about leadership skills of project managers in sustainable construction projects [4; 31-34]

Authors	Title	Skills
Wang *et al.* (2015) [31]	Critical factors for sustainable project management in public projects.	• Leadership. • Process control. • Communication.
Li *et al.* (2013) [32]	Project management factors affecting green building projects: Case study of Singapore.	• Communication. • Leadership. • Problem solving.
Hwang and Ng (2013) [33]	Project management knowledge and skills for green technologies.	• Decision making. • Delegation. • Analytical. • Teamwork. • Problem solving. • Leadership. • Negotiation. • Human behavior. • Chairing meetings. • Presentation.
Hwang and Ng (2013) [34]	Are project managers ready for green construction? – Challenges, knowledge areas and skills.	• Analytical. • Decision making. • Team working. • Delegation. • Problem solving.
Robichaud and Anantatmula (2011) [4]	Greening project management practices for sustainable construction.	• Planning and strategy meetings. • Communication and document-sharing. • Teamwork.

Five (5) publications related to project managers' leadership skills in sustainable construction projects have been identified. Based on Table 3, most of the authors highlighted communication and teamwork as the most important skill for project managers in sustainable construction projects. To be successful, communication is important for project managers in green projects to deliver sustainable practices across multidisciplinary project teams [4; 33]. Sustainable construction projects can be more complicated than traditional projects thereby increasing the need for project team communication and teamwork. Added to that, Robichaud and Anantatmula suggest that project managers should lead a team process to establish clear guidelines for communication and ground rules for teamwork, such as training to enhance these skills [4].

Although leadership skills have been identified as a key factor in effective management, the topic is still not widely considered [35], therefore further research is needed in order to understand these skills comprehensively. The next section will discuss the identification of the appropriate leadership skills for project managers in the pre-construction phase of sustainable construction projects.

5 Leadership Skills of project managers in the pre-construction phase of sustainable construction projects.

Most of the challenges faced by project managers in implementing green building arise in the pre-construction phase [4, 5]. This is due to the need for a more detailed (green featured) planning process as well as the involvement of different project team members, such as green specialists, which may slow-down the pre-the construction phase [5]. Yet, the role of project manager as a leader in the pre-construction phase is important to maintain the momentum throughout the construction process. Besides that, the competencies, skills, and sustainability knowledge of the project manager will ensure the success of sustainable construction projects [5, 36-38]. Appropriate literature on the roles and leadership skills of project managers in sustainable construction projects identify the appropriate leadership skills for a project manager. Therefore, based on the literature, eight (8) leadership skills appropriate for project managers in the pre-construction phase of a sustainable construction project are identified as follows:

5.1 Communication skills

Communication skills involve an ability to exchange information with a person or group. Otherwise, communication is especially important for project managers in green projects in order to deliver the sustainable practices that are expected from the project team [24]. For instance, in the initial stage, a project manager needs to successfully communicate with stakeholders about achieving its sustainability goals [39]. This is because a project manager is responsible for holding the initial meetings which benefit the communication between the project teams [4]. Hence, the communication skills of a project manager may accommodate the different perceptions of sustainability among project team and the stakeholders to ensure a successful outcome for the project.

5.2 Motivation skill

The skill of motivation is an ability to enable a person to achieve their goals. Yet, motivation is a skill that a project manager can apply to ensure that the project team achieves the project's goals in time and on budget [40]. In the early phase of a sustainable construction project, a project manager needs to motivate the project team in order to achieve sustainability goals. However, the lack of such motivation often leads to conflict, strikes, low productivity, stress, and the failure of the project [41]. Project teams have lower levels of motivation when they are not fully aware of the green project process [4]. Besides, motivation is the key to ensure that the stakeholders, such as the project owner and the developers, constantly engage with green building practices [42].

5.3 Decision-making and problem-solving skills

Decision-making and problem-solving skills involve the ability to define and solve problems. Decision making is a process of obtaining a team commitment to, and collective support for, sustainability [41]. For example, in the planning and design stage, there is a need for the project manager to decide the best possible selection of technologies, systems, and subcontractors required for green projects [5]. Tools and practices are necessary for the project manager to support decision making for managing sustainability criteria in a project. However, problem solving is different from decision making as it is a process of analysing the sustainability criteria and identifying the possible solutions [29].

5.4 Conflict management skill.

Conflict management skill is the ability to resolve conflict in a positive way. Conflict management has also been identified as one of the important soft skills that influence the achievement of project success by the project managers [43]. Effective conflict management by the project manager can deal with the details of stakeholder relationships thereby preventing the project experiencing delays in addressing issues and restricting the expense of resolving disputes. For example, conflict within the project team may be unavoidable and project managers must be equipped to manage conflict effectively without affecting project progress [5]. In addition, the project manager should pay **close** attention to the coordination between design consultants and the construction team as well as to the technology innovations so that the likelihood of success in green building projects can be enhanced [32].

5.5 Delegation skill

Delegation skill involves working with subordinates to establish direction, authority, and responsibility. Without this skill, the ability of a project manager to manage the team and deliver results will be limited [44]. Also, delegation skill is important in making the best use of the project team and the project manager provides the ability to focus on the real situation [45]. Delegation skill is essential for the project manager in the pre-construction phase, particularly in the planning and design stage, in order to distribute tasks among a qualified project team.

5.6 Planning and goal-setting skills

Planning and goal setting skills involve an ability to plan a process and to achieve the desired goals. During the planning and scheduling process, a project manager should consider the impact of green criteria on the overall schedule for the construction works [46]. The plan of work should be explained to all parties (stakeholders and the project team) such as in the pre-start meeting where all parties need to work together **to** establish project feasibility so that the project manager can implement a smooth construction schedule [4]. Besides that, setting feasible and sustainable priorities during the project will help to establish a framework for all future decision making [45].

5.7 Team building skill

Teams are defined as groups of people who have skills that are committed to a common purpose and who hold themselves mutually responsible for its achievement [47]. Ideally, teamwork is when a group of people work together in a way that is coordinated and mutually supportive to achieve goals. Project managers should also be engaged in team building skills for the success of their project. The results of a survey from Singapore revealed that project managers who are equipped with good team building skills can improve project team cohesiveness as well as enhancing the overall project team performance [5].

5.8 Negotiation skills

Negotiation skills involve an ability to discover common ground and reach agreement to settle a matter. Project managers need to apply negotiation skills throughout the project life cycle [48]. For example, a project manager should negotiate among stakeholders and the project team about various aspects of the pre-construction phase such as the scope of the project, deadlines, resources, the team structure that is required to deliver the project, targeted achievements and other things that occur during the project [47].

6 Conclusions

Capabilities and leadership skills can clearly contribute towards project manager performance and to sustainable construction project development. This paper is expected to help project managers to improve leadership skills in managing the pre-construction phase of sustainable construction projects. This is important in order to accelerate the progress in managing the pre-construction phase of sustainable construction projects as well as to enable project managers to improve their leadership skills when managing such projects.

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