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Factors Influencing Selection of a Project Manager for Energy Retrofit Projects in Ghana

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Abstract
Project management is a complex process that requires commitment, strong will and teamwork to ensure success in terms of cost, time, quality, safety and client satisfaction. The concept of green renovation is new as actions to reduce CO_2 continue to capture the attention of the world. The main aim of the study is to align the concept of green renovation to the selection of competent project managers/consultants. A survey of selected district assemblies in Ghana was undertaken. The nature of green renovation influenced the selection of the district as those with no records of such renovations were not included. District assemblies are motivated to select project managers with adequate working experience and knowledge of sustainable technologies. The results indicate ability to work effectively in a team, evidence of adequate training and green renovation projects managed also influence selection of a project manager. The theory underpinning project management reinforces the results identified as challenges that hinder effective project delivery are addressed. The findings inform government decision to engage project managers for green renovation projects and provides literature for teaching and learning.

Keywords
Project Management, Project Manager, Green Renovation, Experience, sustainable technology, policy

1. Introduction
Green renovation is the process of using sustainable strategies and technologies to improve existing buildings and systems to deliver energy and CO_2 savings. Green renovation or sustainable upgrade generally applies to existing buildings, equipment or systems that present poor environmental outlook. The form of upgrade depends on cost of renovation, availability of technologies and technical skills to undertake renovations. The role of a project manager (PM) is critical to the delivery or execution of green renovations. Thus, a project managers' understanding of energy retrofit project contributes to improved project performance. Often, urgency of a project at hand, project duration, variations, political influence from higher authority, untimely decisions on the part of the consulting team and a lack of experience of the design team affect the performance of consultants (Dadzie et al., 2012).

Attitude and general personal characteristics of a project manager and success were linked by Ha and Tran (2018) and the role of project managers by Jazebi and Rashidi (2013). Sharma and Kumar (2018) highlighted enthusiasm, high self-esteem, political sensitivity, ability to delegate and evidence of capacity to mobilise as factors influencing selection of project managers. A successful project manager should be able to delegate, that is, allow subordinates to participate in decision making which is in tandem with effective project delivery. A project manager should be flexible, patient and persistent, with good communication skills, be a good planner with credible capabilities (Horvath, 2019). These factors in one way or the other ensure successful project delivery as the PM provides leadership (Sharma & Kumar, 2018). Kondalkar (2020) discussed the concept of organisational behaviour and relates that to the functions of a project manager. A client expects a project management team to deliver on time and within budget by supporting the functions of a builder. Technical understanding of all forms of construction including green renovation is therefore relevant to the success of a project manager. Clients are always looking for a consultant capable of meeting

project timelines at a reasonable cost. To be successful as a project consultant requires strong commitment, capacity to work with different people and the ability to work effectively in a team (Sankaran et al., 2020).

A methodology for selecting project managers is studied and extensively reported in the literature. Jazebi and Rashidi (2013) developed an automated procedure for selecting project managers in construction firms. The model used 15 field data and fuzzy rules to develop a predictive model. Moradi et al. (2020) presented a competency model for the selection and performance improvement of project managers in collaborative construction projects using behavioural characteristics. Chaghooshi (2016) proposes the joint use of the Fuzzy DEMATEL (FDEMATEL) and Fuzzy VIKOR methods of a decision-making process for selecting the most suitable managers. The FDEMATEL method is used to prioritise the importance of various criteria and the FVIKOR is used to rank the alternatives in a preferred order to select the best project manager from several alternatives. Similarly, Çelikbilek (2018) proposes a Grey Analytic Hierarchy Process (G-AHP) for engineering and managerial problems with grey systems to make objective decisions. The results of the case study concluded with the effectiveness and applicability of the proposed G-AHP method for science, engineering and management. These methods are for the selection of a project manager, not providing detailed information of factors that influence selection, particularly for green renovation. The main aim of the study is to investigate factors influencing the selection of a project manager for green renovation projects. To date, the extent to which project managers are assessed with green related parameters to motivate selection is lacking. Many studies are aligned to the conventional construction approaches as the concept of green renovation is often not addressed. Identifying and investigating these factors, the concept of green renovation is reinforced and tied to reductions in CO_2 emissions.

2. Settings and Methods

2.1 Theoretical framework
PMBOK® defines a project as a temporary endeavor to create a unique product, service, or result. Levy (2018) defines project management as "application of knowledge, skills, tools and techniques to meet project requirements". Project management is accomplished through the application and integration of concepts such as project initiation, planning, executing, monitoring and controlling and closing. It is the process of planning, directing and controlling resources to ensure high level of project performance which is normally expressed in terms of time, cost, quality and stakeholder satisfaction (Meredith, 2020).

Factors that influence selection of a project manager
The role of a project manager is distinct from that of a functional manager or operations manager. Typically, a functional manager focuses on providing management oversight for a function or business unit. Operations managers are responsible for ensuring that business operations are efficient. A project manager is a person assigned to lead a team that is responsible for achieving a set of project objectives. The selection of project managers is linked to basic requirements, experience, education, communication, computer and management skills and time management. Other factors include cost, resource, quality and project management skills, planning, interpersonal skills, decision making and team development (Afshari, 2017). A project manager must manage costs, time and resources and be able to plan and develop skills of a project team (Sadatrasool et al., 2016). Also, knowledge, legal skills, communication skills, social awareness, action management, financial management, and ability to identify risk affect decisions to select project managers (Sadatrasool et al., 2016). The authors added that effective human resource management, procurement skills, time management, quality design and control and technical impact selection of a project manager. Sharma and Kumar (2018) discussed factors that influence selection of a project manager to include enthusiasm, high self-esteem and political sensitivity. Although Sharma and Kumar (2018) sought to reinforce findings of earlier studies, ability to delegate, team management good communication skills were identified and included. The position of Sharma and Kumar (2018) is in line with that investigated by Sadatrasool et al. (2016). By proposing the joint use of the Fuzzy DEMATEL (FDEMATEL) and Fuzzy VIKOR methods, Chaghooshi et al. (2016) investigated many variables including site management capacity, technical level, level of leadership and personal qualities. Management capacity include project, program and portfolio orientation, health, security, safety and environment. Earlier studies by Dodangeh et al. (2014) and Sadeghi et al. (2014) applied various selection criterion in developing selection tools and models. They are basic requirement, project management skills, management and interpersonal skills. Sadeghi et al. (2014) relied on the competencies for project managers, records of past performance and behavioural parameters.

Wen et al. (2021) developed a new method that focuses on fuzzy multiple decision-making methods in civil engineering. The outcome of the study addresses the issue of high error in decision making, which is a very common

phenomenon in the construction industry. The models were examined using a case study in a project-based organization for selecting the most suitable project construction manager. Education, planning, controlling, communication skills, experience etc., were used for the second round of a Delphi approach. The third round involves basic requirements, management skills, interpersonal skills and project management skills. Manaan et al. (2014) demonstrated a fuzzy-based method for assessing the performance level of a project manager (PM) at the construction phase of Mass Housing Building Projects (MHBPs). Seven competencies including knowledge of appropriate site layout techniques for repetitive construction works, dedication and knowledge of appropriate technology transfer were applied (Manaan et al. 2014).

Afshari (2018) showed that in small projects, a PM with strong communication skills is needed to maximize performance, whereas negotiation skills in medium projects and project management knowledge in large projects are the most critical. Gharouni and Noorzai (2021) propose a framework to determine the most appropriate project manager (PM) to enhance the performance of occupational groups (POGs) in large, medium and small road construction projects in warm regions. The occupational groups (OGs) in road projects were divided into three categories: workers, technicians, and engineers. Using the Pareto principle, 14 critical project manager competencies (PMCs) were extracted from a 70-item list developed by performing a comprehensive literature review. Two indexes were ranked in each size of road project using the analytic hierarchy process (AHP) technique.

Similarly, leaderships, technical skills, performance level and certification level for each project manager is a critical selection criterion (Keren et al., 2014). Other factors include computer knowledge, experience, age, education depth of the expertise, extent of comprehensive knowledge and management knowledge (Afshari & Kowal, 2017). Leadership, communication, staffing, decision making, character, psychology, physiology influence project manager selection (Afshari & Kowal, 2017). Luțaș et al. (2020) identified the profile of an ideal project manager by presenting an overview of studies regarding the profile of a good project manager. In that regard, the authors analysed the perceptions of organisations' managers and HR specialists. The empirical research provides evidence that persons involved in project managers' selection perceive the value of education, certification, experience or soft skills differently, based on their professional role. Secondly, it shows that project management certifications are relevant for project managers' selection and are much appreciated around the world. Although each project requires specific skills and competencies of a project manager, the research ascertains a preferred profile based on the perception of over one hundred respondents, involved in the selection process. Mohammadi et al. (2014) developed an approach in the form of a hybrid Quality Function Deployment (QFD) and Cybernetic Analytic Network Process (CANP) model for project manager selection. This involves the use of QFD to translate the owner's project management expectations into selection criteria and the CANP to examine the expectations and selection criteria. The research involves the development of 18 selection features in response to the owner's three main expectations of time, cost and quality. Other factors include experience, academic achievement, communication skills, Microsoft Project Software experience and planning skills were the selection criteria adopted and applied to develop the model. The survey of literature shows that planning, project initiation skills, implementation and closeout are important in the selection of a project consultant (Moradi et al, 2021). Sang et al. (2018) studied the effects of project manager competency on green construction performance in China. The study identified the position of a project manager as an important factor determining the success of a project that is complex in nature. The authors argued that with the deterioration of the environment, green buildings present better environmental outlook compared to conventional buildings. Green buildings encounter more complex problems during the construction process thus project managers are faced with greater challenges. A survey questionnaire was used to investigate the understanding of the importance of project manager skills. Structural equation modelling was applied and the results demonstrate leadership skills and emotional intelligence of project managers are important factors that affect green construction performance.

2.2 Research methodology

In line with the research questions, a quantitative approach is adopted to explore and discuss factors that influence selection of project managers for green renovation. The study is focused on projects that align to sustainable upgrade

of existing buildings. District assemblies and regional coordinating professionals in Ghana are the main respondents. A five-point Likert scale was used to understand factors that affect selection of PMs for sustainable upgrade projects. The respondents were asked to rate the items in relation to the degree of agreement or importance as 1=strongly disagree; 2=disagree; 3=neutral;4=agree;5=strongly agree. A pilot survey of experts to test the variables for suitability as the concept of green renovation is new to many professionals. A total of 15 professionals were engaged online during the pilot stage of the study. Specific modifications to the variables were proposed that helped to restructure the survey for distribution. Thereafter, potential respondents were identified through personal contacts or referrals from staff of the district assemblies. The survey was sent to 182 professionals at the district and regional assembly level with adequate knowledge and understanding of green renovation. Those with no clear insight of the concept of sustainability and related impact of green renovation on the environment were excluded. Also, poorly answered survey questionnaires were rejected. The survey covered a period of 3 months as attempts to improve the initial response contributed to extension of the survey. The last month served as a mop-up to encourage professionals to participate. Within the first month, 25 professionals had responded, this was improved in the subsequent months. Overall, 55 professionals responded, providing a response rate of 30.2%. The mean and standard deviation as applied in this study are consistent with similar studies related to environment and energy efficiency.

$$Mean = \frac{\sum_{i-1}^{5} W_i \cdot X}{\sum_{i-1}^{5} X_i}$$

where: i – responses category of a Likert scale – 1,2, 3, 4, 5. W_i – is the weight assigned to i^{th} response – (5 is Strongly agree, 4 for agree, 3 for neutral, 2 is disagree, 1 for strongly disagree); and X_i – frequency of the ith response. The Chi-squared test for the study is given by:

$X^2 = \sum \frac{(O_i - E_i)^2}{E_i}$, Where X^2= Chi-squared, O_i = observed value, E_i =expected value

3. Results

Calculated means provide the descriptive analysis of the study for detailed and further analysis, based on the maximum and minimum values. The standard deviation estimates become relevant as that forms basis for ranking of similar means.

3. 1 Factors influencing selection of project managers for green renovation

Table 1 presents the overall results of the study on the factors that influence selection of PMs for energy retrofit projects. The Table presents the factors, mean, standard deviation, variance, rank, p-value and the hypothesis.

Table 21. Factors influencing selection of project managers for green renovation

S/N	Factors	Mean	SD	variance	Rank	p-value	Decision
1	Academic Qualification	4.88	0.853	0.7276	1	0.002	Reject
2	Working experience	4.44	0.769	0.5914	4	0.001	Reject
3	Relationship with clients	3.94	0.667	0.4449	13	0.000	Reject
4	Human relations	3.52	0.718	0.5155	21	0.000	Reject
5	Conflict management skills	3.72	0.832	0.6922	17	0.000	Reject
6	Work effectively in a team	4.24	0.891	0.7939	8	0.000	Reject
7	History of delays	4.18	0.946	0.8949	10	0.000	Reject
8	History of payment	3.85	0.862	0.743	14	0.063	Accept
9	Records of cost overrun	3.45	0.684	0.4679	22	0.000	Reject
10	Availability of funds	3.36	0.734	0.5388	23	0.000	Reject
11	Safety records	4.01	0.647	0.4186	12	0.144	Accept
12	Green renovation projects managed	4.75	0.854	0.7293	2	0.000	Reject

13	Green certified/NABERS	3.56	0.733	0.5373	20	0.000	Reject
14	Interest in continuous green training	3.65	0.688	0.4733	19	0.000	Reject
15	Energy and Co2 emission savings	3.70	0.721	0.5198	18	0.000	Reject
16	Cleaner construction records	4.23	0.869	0.7552	9	0.070	Accept
17	Size of green renovation project	4.56	0.987	0.9742	3	0.000	Reject
18	Understanding of green renovation	4.36	0.88	0.7744	6	0.000	Reject
19	Experience of workers	3.02	0.897	0.8046	24	0.000	Reject
20	Type of technologies involved	3.74	0.875	0.7656	16	0.000	Reject
21	Quantity of technologies involved	3.81	0.779	0.6068	15	0.311	Accept
22	Location of project	4.25	0.722	0.5213	7	0.000	Reject
23	Cost of project	4.09	0.86	0.7396	11	0.000	Reject
24	Project duration	4.41	0.786	0.6178	5	0.000	Reject

In all 24 factors were affirmed after the initial pilot study that identified over 30 variables. The pilot study reinforced the initial data by contributing to the rejection and modification of variables. Table 1 presents the factors that influence the selection of project managers or consultants. Academic qualification (mean = 4.88), green renovation projects managed (mean = 4.75), size of new green renovation project (mean = 4.56), working experience (mean = 4.44), project duration (mean = 4.41), understanding of green renovation (mean = 4.36), project location (mean = 4.25), work effectively in a team (mean = 4.24), cleaner construction records (mean = 4.23) and history of delays (mean = 4.18) ranked from 1st to 10th in that order. Least ranked factors include quantity of technologies involved (mean = 3.81), type of technologies (mean = 3.74), green certification (mean = 3.56), availability of funds (mean = 3.36) and experience of workers (mean = 3.02). Chi-square test results confirm the rejection of the null hypotheses that the factors do not affect selection of project managers for green renovation projects. Table 1 shows that for each of the independent variables $X^2est > X^2\beta$ at $p<0.05$. This implies that the factors do affect selection of project managers hence rejection of the null hypothesis. There is a strong statistical relationship between the variables and selection of project managers.

4. Discussion

The academic qualification provides detailed information about the level or expertise of project managers. According to the results the Ministry of Local Government is interested in the training and academic background of experts. To be successful at the expression of interest stage of a tender process, a consultant or project manager should present required and expected qualifications. Project managers without the appropriate qualification tend to perform poorly thereby negatively impacting the project in terms of cost, quality and safety. Critical verification of training and other forms of training in line with construction management ensure that delays and project failures are avoided (Alvarenga et al., 2019). The concept of green renovation makes the issue of academic qualification important as it is a unique area, new and relates closely with CO_2 emissions. The results agree with Creasy and Anantatmula (2016) in a study that indicates personal traits have a relationship with project success. The uniqueness of green renovation makes it necessary to have evidence of past projects managed and the level of success achieved. Having the qualification does not guarantee selection, however being able to present details of green renovation managed in the past presents a positive outlook. Clients are interested in the number of green renovation projects managed and the success rate. The local government officers consider a project manager or consultant qualified by looking at the nature of energy retrofit projects undertaken, records of systems adopted and the energy savings obtained. Given the technologies adopted and the volume of works executed, clients are presented with the necessary data to aid decision making processes. The results indicate the size of green renovation as a factor that motivates selection of project managers. Identifying size of projects handled provide basis to connect experience gained to a new project. New projects are complex particularly energy conservation renovation projects, thus the size also relates to experiences and selection decisions (Hadad et al., 2013). For example, a project manager with no experience of pumps, motors, cooling systems, cooling tower systems retrofit may not be able to handle similar projects.

5. Conclusions

Past studies on project manager selection are focused on conventional buildings, with little knowledge on the concept of green renovation. Indeed, the literature presents little information on the factors that influence selection of project managers for green renovation. The main aim of the study is to investigate factors influencing selection of project managers for energy conservation refurbishments. The literature review provided secondary data of various factors although there is little information on energy retrofit and selection of project managers. A survey design in the structure of a questionnaire ensured factors that influence selection of consultants are identified and investigated. As presented in Table 1, the main factors include academic qualification, green renovation projects managed, size of green renovation project, working experience, project duration, understanding of green renovation and project location. The study is limited to a developing economy thus future studies can focus on expanding the variables. The findings fill the gap in the literature and provide data for the selection of project managers. Policy makers are provided with a tool to follow in relation to appointment of project managers or consultants for green renovation projects.

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