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Leadership Behavior of Project Managers in Sustainable Construction Projects

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Abstract

The construction industry has been perceived as dominant in stirring to move societies for sustainable development in an international framework. As a result of a theoretical perspective, this research extends leadership competencies as hierarchical, reflective constructs, integrating eight involved components. The analysis was done making use of a sample of 70 project managers in eco-friendly building projects. The results exhibits that the leadership competencies of project managers as second-order reflective constructs end up with considerable direct influences on success criteria for sustainable buildings. Furthermore, the outcomes suggest that the intellectual competence of project managers represents the most considerable factor on sustainable building accomplishments. On the whole, this research ends by going over the findings, methodological inferences, limitations, and prospective recommendations for further research.

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1. Introduction

Over the past decades local and international communities have recognized the construction industry, and particularly the building sector, as vital in encouraging societal change toward sustainable development in a global context [1, 2]. Chapter 7 of the United Nations Earth Summit Agenda 21, the action blueprint for “promoting

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sustainable human settlement development” advocates the promotion of sustainable construction industry activities and working together to take action towards achieving ‘sustainable human resource development and capacity-building for human settlement development’. In this regard, it can be said that construction leaders and/or project managers of sustainable projects may improve sustainable performance by influencing or even transforming subordinates [3].

The leadership style and the way the project as well as subordinates are managed, can result in improved productivity and, more important, transform the project towards sustainability. Nevertheless, considering the construction industry in developing countries like Malaysia, strength in terms of sustainability, has not yet reached an adequate level. In this country, challenges of sustainable construction and development are not really being dealt with. Consequently, new research findings will contribute substantially to the country’s construction sector, by offering insights to the field of leadership style in sustainable construction projects. On the flip side, recent research in sustainable development in the industry has focused mainly on design concepts for sustainability [2] whereas, limited research has been conducted into leadership competencies and quality practices of the leaders in sustainable development of building projects. This lacuna in knowledge motivated this research study that has been designed to build a model to study the most effective leadership competence in sustainable building construction in order to answer the following question: Does the leadership style of the leaders affect the achievement in success criteria of the green building projects?

As a result, a key significance contribution of the study that also distinguishes it from other publications in sustainable building construction is, the focus on leadership competences of those project managers engaged with green building projects. The remainder of the paper is organized as follows: Section 2 discusses the pertinent literature on the constructs of leadership and sustainable construction. Section 3 presents the Success Criteria for Sustainable Building Projects for the construction of the hypotheses that are tested in this study. Research methodology and data analysis are described in section 4, followed by the assessment of the structural model (section 5). We discuss our findings and conclusions in section 6. The paper finishes with a short paragraph on the limitations and future research directions in section 7.

2. Leadership

The broad concept of leadership can be summarized in three interrelated domains: personal characteristics of the leader, leadership style and situational theories [4]. In other words, leadership is a dynamic behaviour and a leader’s role with regard to an ideal style varies with different circumstances and traits. Consequently, no ultimate leadership behaviour exists [5] and the many ways that leadership has been conceptualized will influence “the relationship among leaders and followers who intend real changes and outcomes that reflect their shared purposes” [6]. Therefore, dealing with rapid, complex, and often discontinuous change requires effective leadership. Although the importance of leadership has been regarded as a success factor for organizations, in regard to project context there have still not been enough empirical studies on the association between leadership style and project success [7], particularly in the context of sustainable construction. However, overall project success consists of several dimensions that depend on the manager’s leadership style [8, 9] and competences [10, 11]. Corresponding to the competence school of leadership, [11] performed a comprehensive review of current theories and determined fifteen leadership dimensions that can be grouped under two competences; intellectual (IQ) and managerial (MQ), and a personal characteristic measurement named emotional and social dimensions (EQ).

2.1. Sustainable construction

Construction and buildings can contribute substantially to the realisation of sustainable development. Research related to the building industry is focusing on the growing concerns related to the consumption of natural resources (i.e. water, wood, energy, materials) [12] as well as to the production of substantial amounts of CO₂ emissions [13]. Added to that, different types of environmental pollution have been reported during the life cycle of a construction project [12]. Ignorance of green construction operations is likely to result in serious environmental problems [14] and, therefore, the building industry should be alert to these risks as well as cautious of sustainable alternatives to improve its environmental and social footprint [15].

2.2. Sustainable construction and leadership

Although leadership has been acknowledged as a success factor for the performance of organizations, there is limited research on the relationship between leadership competencies of project managers and especially managers in the construction industry. These leaders should have the values and skills to promote a positive culture towards sustainable development. In a rather recent research Hwang and Ng (2013) explored the challenges in ‘green’ construction projects and they identified the knowledge areas and skills that competent project managers should possess to meet these challenges [16]. Nonetheless, leadership style and competencies of sustainable project managers need to be further explored for their statistical relationship with project success criteria. This became the focal point of this paper and motivated the research described in the subsequent paragraphs.

3. Leader competencies and success criteria for sustainable building projects

The Malaysian Institute of Architects formed a Sustainability Committee which was established mainly to develop the Green Building Index (GBI) and the related section for accreditation and certification of green-rated buildings in August 2008. The GBI Building Rating tools assess the sustainability of buildings based on six key criteria as demonstrated in Table 1. Consequently, these specific set of guidelines were employed to measure the success criteria that project managers attained in their green building projects.

Table 1. Key criteria for evaluating success sustainable building construction used for this study

Success Criteria
Energy Efficiency (EE)
Indoor Environment Quality (EQ)
Sustainable Site Planning & Management (SM)
Materials and Resources (MR)
Water Efficiency (WE)
Innovation (IN)

The above mentioned criteria can motivate developers and building users to consider the environmental quality of buildings and associated inhabitants via improved site selection, conditions to acquire access to public transportation, enhanced local community services and connectivity, as well as enhanced infrastructure facilities.

3.1. Hypotheses tested

The literature review revealed the importance of leadership research for sustainable development. In view of the analysis, the current study targets to explore the impact of intellectual and managerial competencies of the leader on the success of a sustainable building project. Therefore:

Hypothesis 1: Leader intellectual competence is positively related to the success criteria of the projects.

Hypothesis 2: Leader managerial competence is positively related to the success criteria of the projects.

4. Research methodology and data analysis

For the purpose of data collection, a survey questionnaire was distributed among 70 construction project managers who had applied for or were certified by the GBI assessment of Malaysia [26]. Three research officers were sent to companies in different locations in large cities in Malaysia to deliver the questionnaires to the relevant respondents and to collect them for the purpose of data analysis. 5-point scale questionnaire was used. To assess the hierarchical hypothesised model, Smart PLS was applied to determine the parameters of the model [25]. PLS places minimal demands on sample size and residual distributions and in this study, PLS path modelling was used with a path-weighting scheme for inside approximation [17, 18]. Afterward, nonparametric bootstrapping was applied with 200

replications to obtain the standard estimate errors [17]. To evaluate the higher order latent variable, the method of repeated indicators was used [19, 20, 21].

4.1. Managerial competence assessment

The study extends prior research by conceptualising the managerial competence as a hierarchical, reflective construct [22] and examining its relationship with success criteria that assessed project managers' level of achievement in their sustainable building projects. It is proposed that the managerial competence, determined by evaluating how the five extracted attributes identified by [11] including resource management, engaging communication, empowering, developing and achieving, affect achieved success criteria. However, each dimension of the managerial competence reflects a unique belief, whereas the set forms a solid foundation for hierarchical managerial competence modelling in a nomological network. In this hierarchical construct the degree of variance explained was reflected on its components: resource management (76.9%), engaging communication (88.3%), empowering (19.7%), developing (82.2%), and achieving (83%, see Table 2). All of the path coefficients from managerial competence to its components were significant at $P < 0.01$. Here, for the construct of managerial competence the CR and AVE values were 0.941 and 0.536, respectively, which are above the cut-off values.

Table 2. Second-Order Managerial Competence and its Association with the First-Order Components

Resource Management	Engaging Communication	Empowering	Developing	Achieving
$R^2=0.769157$	$R^2=0.883001$	$R^2=0.197417$	$R^2=0.821685$	$R^2=0.829843$
$\beta=0.8477$	$\beta=0.9187$	$\beta=0.6584$	$\beta=0.8956$	$\beta=0.9063$
$P<0.01$	$P<0.01$	$P<0.01$	$P<0.01$	$P<0.01$

4.2. Intellectual competence assessment

In a similar fashion, the study extended the intellectual competence as a hierarchical, reflective construct [22] and evaluated its relationship with those success criteria. The intellectual competence of a project manager was also evaluated. This was identified through the three extracted attributes identified by [11] including critical analysis, strategic perspective and vision and imagination (see table 3), which affect positively the attained success criteria in sustainable building projects. Furthermore, each dimension of the intellectual competence also echoes an exclusive perception; whereas, the specified component features a reliable basis for hierarchical intellectual competence modelling in a nomological network. In this hierarchical construct the degree of variance explained was reflected on its components: critical analysis (87.2%), strategic perspective (87.6%), and vision and imagination (65.3%, see Table 2). All the path coefficients from intellectual competence to its components were also significant at $P < 0.01$. For intellectual competence the CR and AVE values were 0.926 and 0.514, respectively, which are above the cut-off values.

Table 3. Second-Order Intellectual Competence and its Association with the First-Order Components

Critical Analysis	Strategic Perspective	Vision and Imagination
$R^2=0.872285$	$R^2=0.876312$	$R^2=0.652551$
$\beta=0.9361$	$\beta=0.9449$	$\beta=0.7962$
$P<0.01$	$P<0.01$	$P<0.01$

5. Assessment of the structural model

In Table 4 and Figure 1, the results give a standardised beta of 0.596 from intellectual competence to success criteria and 0.239 from managerial competence to success criteria. Thus, support could be found for H1 and H2. However, the total R^2 for this model was 0.68.

Table 4. Total Effects

	Beta Value	t-value	P-value	Standard Error
Intellectual Competence -> Critical Analysis	0.9361	61.6492	*****	0.0152
Intellectual Competence -> Strategic Perspective	0.9449	67.7289	*****	0.014
Intellectual Competence -> Success Criteria	0.5962	5.0341	*****	0.1184
Intellectual Competence -> Vision and Imagination	0.7962	14.5999	*****	0.0545
Managerial Competence -> Achieving	0.9063	40.7708	*****	0.0222
Managerial Competence -> Developing	0.8956	40.3198	*****	0.0222
Managerial Competence -> Empowering	0.6584	6.9908	*****	0.0942
Managerial Competence -> Engaging Communication	0.9187	54.6438	*****	0.0168
Managerial Competence -> Resource Management	0.8477	24.9433	*****	0.034
Managerial Competence -> Success Criteria	0.2391	2.178	0.01494	0.1098

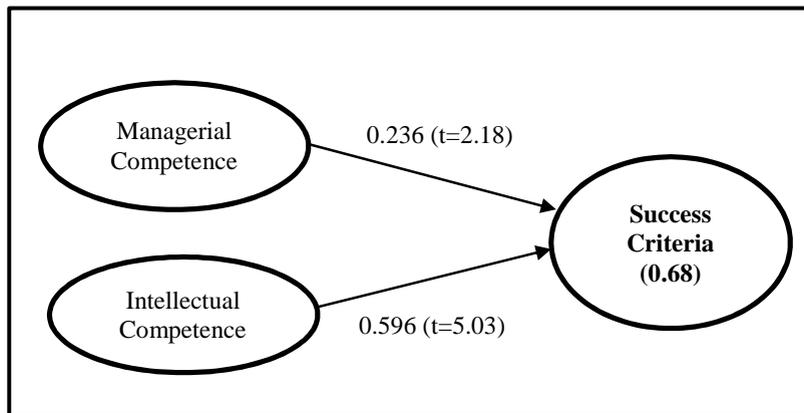


Fig. 1. Results of Model Testing

6. Discussion

Eight leadership attributes were assessed and kept by this research to measure the two constructs: intellectual competence and managerial competence (see table 4). The results of the study show that among all dimensions of leadership competencies, strategic perspective ($\beta=0.945$) is the most significant factor, followed by critical analysis ($\beta=0.936$), engaging communication ($\beta=0.918$), achieving ($\beta=0.906$), developing ($\beta=0.896$), resource management ($\beta=0.848$), vision and imagination ($\beta=0.796$) and empowering ($\beta=0.658$) in project managers. Our study validates the findings from [11] as well as those from [23].

Specifically, [24 and 26] argued that the effect of leadership on employee commitment and performance in a temporary arrangement such as a construction project is not the same as for long term projects. However, they observed that project managers in projectized organizations with transformational behavior same as that of managers in functional organizations have a lower impact on motivation and commitment of their followers. This might be explained by the multiple project leaders and the limited periods of time that they are involved with employees in a project context while team members in a permanent or a long-lasting environment are engaged with mainly one manager for a long period of time.

Our findings show that all attributes are essential to sustainable achievement and are relatively significant in facilitating sustainable building construction. The results also clarify that project managers should possess the necessary leadership competencies, skills and knowledge to be able to achieve sustainability in building projects. Aside from that, the essential aspects of leadership that highlighted in the study will contribute strategically to the transition towards sustainable societies. The ultimate result also provides support for the critical role of project manager in sustainable development, which prompted the LEED Rating System to involve project management development tools and techniques into the most up-to-date overhauling of the rating system. In this regard, the study would like to recommend other green building ratings systems, particularly the GBI of Malaysia, on the way to improve the current rating system in dealing with building construction by incorporating some points and credits for

leadership as one of the project management competencies that related with increasing functionality and flexibility of the construction teams in sustainable or green building projects.

7. Limitations and future research directions

The present study has some limitations that offer a perspective for future study. The main limitation is that this research was performed among project managers in green building projects in Malaysia as a particular context. Adding to this the rather small sample, caution is warranted for the generalization of the findings. Future studies can test the strength of the model in other industries or green projects in different countries. Perhaps it could be of research interest to test the attributes identified in this research along with new ones from the perspective of other stakeholders such as employees or clients of green projects. This will increase the probability of leading successful projects with respect to sustainability.

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