

PRELIMINARY STUDY ON ANTECEDENTS OF SUSTAINABLE CONSTRUCTION AMONG CONTRACTING COMPANIES OPERATING IN MALAYSIA.

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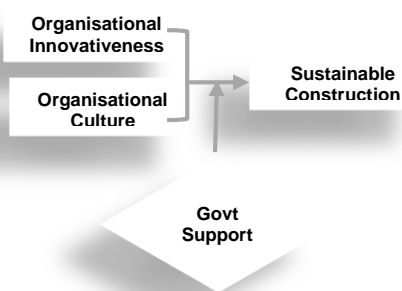
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Graphical abstract



Abstract

There has been an increasing demand on the construction industry to incorporate sustainability practices and principles in their operations and construction products, considering the industry's contribution to environmental degradation. It is therefore crucial for the construction industry to adopt sustainable construction, thereby reducing the negative impacts of construction activities on the environment. While there are several sustainable construction studies in Malaysia, a study that integrates innovativeness, culture, government support and sustainable construction in a single framework has not been given a considerable attention. The objectives of this study are to develop a framework that incorporates the antecedents of sustainable construction; and to assess the validity and reliability of the research instrument. Data were obtained from thirty respondents using a sixty-one item instrument. The data obtained were analyzed using SPSS software to assess the instrument's reliability. The results of the Cronbach's Alpha test reveal a strong internal reliability of the study's constructs and the overall instrument. This paper complements the existing body of knowledge on sustainable construction.

Keywords: Sustainable construction; construction industry; organisational innovativeness; organisational culture; conceptual framework; validity; reliability.

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1.0 INTRODUCTION

Sustainability has become a major concern across the globe, largely due to its benefits on the environment, human society and the economy [1]. Thus, construction industries across countries are currently engaging in sustainable practices and are formulating business strategies in response to the increasing demand from governments and the public for sustainable construction products and processes [2]. There is now a strong recognition that the construction industry must actively play a significant role towards the attainment of sustainable development. The industry is now among the major drivers of sustainable construction achievement [3]. The demand for sustainable construction can be attributed to certain driving factors. Among the most influencing factors are construction stakeholder's

innovation capabilities and propensity [4-11] among others. As such, sustainable construction is now regarded as a road map to achieve the desired change and development. The emphasis is on the adoption of design and construction practices that are efficient in resource consumption and without compromising environmental health or the associated health of the builders, occupants, the general public or future generations [12].

While the Malaysian Construction Industry Development Board (CIDB) in 2011 identified the industry's capabilities to develop and apply advanced design and construction technologies as the most important factor that could guarantee the industry a prominent place within the international marketplace [13], literature affirms that inefficient culture, methods and practices, lack of innovations and performance improvement are part of the

problems that hinder the implementation of sustainable construction. Thus, the drive towards the implementation of sustainable construction could be resulting from the government's involvement and support in terms of regulation incentives provided to construction firms that implement it [14-17].

However, there are diverse views among scholars on the antecedent factors of adoption that could possibly drive construction firms to implement sustainable construction [18-22]. This could be a result of the failure of the previous studies to examine organizational innovativeness, culture and external factors as antecedents of sustainable construction in a single comprehensive framework.

In narrowing the gap aforementioned, this paper examines organizational innovativeness, culture and government support as antecedents of sustainable construction among the contracting companies operating in Malaysia.

2.0 CONCEPTUAL FRAMEWORK

While the literature on the concept of sustainable construction reveals that there are certain

antecedents of sustainable construction, there is a need to further develop a framework that integrates other antecedents not examined in previous studies to achieve a successful implementation of sustainable construction practices.

In this study, sustainable construction is the outcome of organizational innovativeness, whereas organizational culture functions as the dependent variable. Organisational innovativeness and organisational culture are thus regarded as the drivers of the implementation of sustainable construction. External factors, operationalized as government support moderates the relationship between organisational innovativeness, organisational culture and its outcome, which is sustainable construction. From the literature, the commitment of efforts and resources required from contractors to meet the need for sustainable construction adoption is motivated by certain underlying factors [21]. The proposed framework for this study is presented in figure 1 below, where it depicts the relationship between organizational innovativeness, organisational culture, external factors, and sustainable construction.

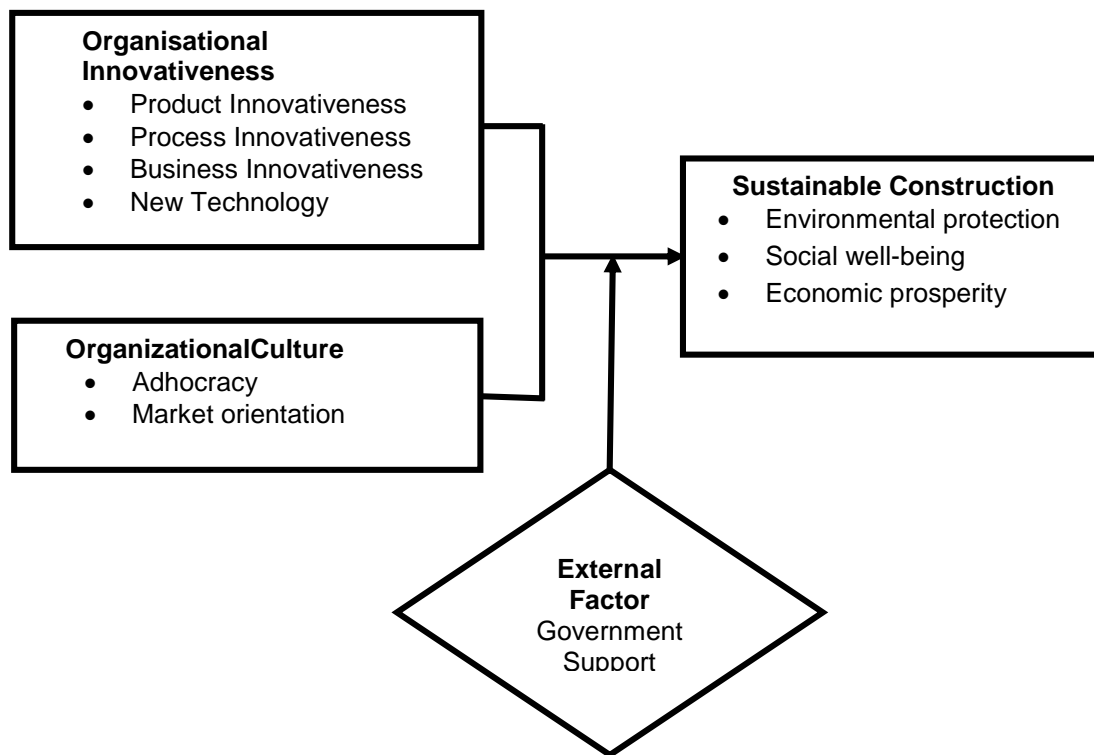


Figure 1 Conceptual framework

2.1 Sustainable Construction

Sustainable construction emerged owing to the construction industry's continuous resource-inefficient construction by utilising polluting substances, excessively specifying inefficient equipment, and

being dependent mostly on pollution-laden transport forms [23]. Also, the construction industry is irresponsive to several social sustainability issues like the quality of human existence, its employees' safety, skills training and capacity building for the less privileged, minimization of poor working conditions, fair

distribution of the construction's social benefits, and adherence to intergenerational justice [12;24]. Thus, sustainable construction is aimed at restoring and maintaining harmony between the natural and the built environments in order to create settlements that affirm human dignity and encourage economic equity [25]. By doing so, sustainability within the built environment has been taken beyond just the resource efficiency and ecological principles by introducing the idea of restoring the environment, as well as explicitly highlighting the social and economic aspects of sustainability. It thus shows that by adopting this concept, construction activities' impact on sustainable development is considered to fall under three dimensions, which are: social, economic, and environmental considerations. Previous studies have however highlighted that the successful implementation of sustainable construction is a function of the identification of its antecedents. Thus, organisational innovativeness and organisational culture have been identified in this study as the antecedents of sustainable construction.

2.2 Organisational Innovativeness

There is a growing concern about the influence of organisational innovativeness as a possible antecedent to sustainable construction adoption. [4] demonstrated how innovativeness is capable of influencing not only organisational productivity, profitability and competitiveness, but also it is capable to be a vital procedure in sustainability adoption in an organization. [8] has earlier found that sustainable construction has always been improved with the help of innovativeness, while emphasizing the roles of end users as drivers of innovations for sustainable construction. This is consistent with the work of [26] who argued that by developing innovative construction technologies and products, the ecological burden of construction projects could be reduced. This will require the construction firms to change their technologies and to better understand the fundamentals of sustainability in the construction project execution.

Other previous studies concerning innovative products, process and business strategies confirm that firms that incorporate sustainability in their orientation and innovation processes mostly exhibit value creation in terms of introducing new product to the market, sometimes called radical innovations [27]. [6] also affirmed that construction organisations' choice of innovations could possibly address sustainability issues in construction as the development of a green technology strategy involves a strong innovation focus. In the same manner, several other studies [28-30] supported the view that innovative firms' performance in sustainability adoption is exceptional. As a result, this study posits a positive relationship between the organisational innovativeness and sustainable construction.

2.3 Organisational Culture

Culture emerges in organisations when there is a need to proffer solutions to problems. [31] argues that successful problem solving procedures mostly become the dominant culture in addressing similar issues in the future. Organizations need to determine whether they are only responsible for their economic benefits alone or other concerns as well. If they are to accept the responsibility for other concerns, then decisions have to be made on the relevant issues of concern and how they will be addressed [32]. Thus, the dimensions of sustainable construction must be incorporated into the construction organisation's culture and policy formulations because according to [33], practically all firms contribute to environmental degradation one way or another.

Earlier studies [34-35] have shown that organisational culture not only influences operations within a firm, but also plays an essential role in the efficiency and improved productivity of an organisation. Given its significance in an organisation, it is reasonable to conclude that culture is a fundamental antecedent behind organisational results, as represented by sustainable construction.

According to [36], organisational culture researchers affirmed that a dynamic organizational culture, which adhocracy represents, can influence the role a business entity plays in a society, in terms of corporate citizenship and sustainability. Thus, this present study seeks to assess the relationship between organisational culture (adhocracy culture and market orientation) and sustainable construction of Malaysian construction companies. In this study, adhocracy refers to organizations that are committed to fostering adaptability, creativity and flexibility in addition to producing innovative products and services. Meanwhile, market orientation is a culture that creates the necessary behaviours for the creation of superior value for buyers.

2.4 Moderating Role of Government Support

According to [37-38], policies on government subsidies have been observed to have a noticeable influence on the processes and outcomes of both new and established firms. Thus, government support in stimulating green construction is the most effective [39; 40] as it is more result-oriented than other techniques. Governments have the capacity to facilitate sustainable construction adoption in a variety of ways, although there are several barriers to developing it [41].

In this study, government support for sustainable construction is considered as the moderating variable due to its strategic implications on firms operating within the industry by providing an impetus to achieve standardized and sustainable construction projects. Properly designed regulations always catalyze improved products and processes and cost reduction [42; 43]. Regulations are designed to govern the practice by way of establishing rules in response to

changes in the market and to technological conditions. This view is corroborated by [44] that the government is capable of driving sustainable construction agenda with a number of policies, including fiscal supports, legislation and standards, and building labeling with energy efficiency rating. As a result of the aforementioned discussion, government support is posited as a moderator between organisational innovativeness, organisational culture and sustainable construction. Properly designed government regulations are believed to have a strategic influence on the construction firms by providing opportunities to achieve the goals of sustainable construction [45].

3.0 METHOD

Considering the fact that this study is at the preliminary stage, samples of the Malaysian contractors were randomly selected. Basically, in the pilot testing, a small scale study of respondents is suggested for trial purpose before conducting the full-fledged study [46]. Ideally, the sample size for pilot studies is suggested to be relatively smaller, ranging from 30 – 100 respondents, although an increase in the sample size for this purpose allows for a stronger result [47]. Hence, a total of Forty-five (45) questionnaires were administered personally during the Construction Industry Development Board (CIDB) seminar on “Innovation & Technology Sustainable Construction”, held at Carlton Holiday Hotel & Suites, Shah Alam, Selangor on 16th June, 2015. Forty (40) questionnaires were returned, out of which thirty (30) were deemed suitable for analysis. These responses were used for measuring the internal consistency of each of the study constructs.

3.1 Research Instrument

According to [48], questionnaire is one of the most appropriate instruments for survey research. Thus, to

ensure that all the constructs in this study are fully measured, questionnaire items were drawn from several sources. The items for the constructs (sustainable construction, organisational innovativeness, organisational culture and government support) were adapted and modified from previous studies [49; 50; 51; 52] to suit this present study so as to establish the item pool and validity of the items. Thus, in order to establish the validity and reliability of the adopted items, a pilot test was conducted mainly to get a projection of the potential problems that are usually faced during the time the main survey was carried out. This study adopted a five-point Likert scale rating to measure responses to the items. A rating scale helps researchers to compute the means and standard deviation responses on constructs as well as the mid-point of the scale. Additionally, a scale between 5 to 7 points is adjudged to be more reliable and valid measure of items than relatively shorter or longer scale points [53].

The constructs in this study are all multi-dimensional except for the external factor, which is uni-dimensional. In Table 1, the details of these constructs and their corresponding dimensions are presented.

3.2 Validation of the Research Instrument

This pilot study was conducted among Malaysian contractors. The participants include the executive directors, project managers, marketing managers, engineers, quantity surveyors, also contract managers representing the G7 contractors. Grade Seven (G7) contractors were selected for this study because they have the privilege to undertake heavy and complex construction projects with no financial limit, and the capacity for the adoption of sustainable construction principles for onsite construction activities [21; 54; 55].

Table 1 Summary of reliability of the research instrument

Constructs	Number of Items	Cronbach's Alpha
Sustainable Construction		
Environmental Protection	8	0.920
Social Well-being	7	0.945
Economic Prosperity	5	0.895
Organisational Innovativeness		
Product Innovativeness	5	0.900
Process Innovativeness	4	0.932
Business Innovativeness	4	0.900
New Technology	4	0.894
Organisational Culture		
Adhocracy Culture	10	0.940
Market Orientation	9	0.887
External Factor		
Government Support	5	0.862

This pilot study was done essentially to get some feedback from the contractors to improve the data collection during the main survey. Earlier, content validity was conducted on the adopted items to test for the validation of the measuring instrument used in this study [53]. Seven experts were selected from the academics and industry to validate and verify the questionnaire before the actual pilot test was done.

The validation process involved four (4) experts from the industry and three (3) experts from the academics. Their suggestions and comments were subsequently incorporated in the modification of the contents and the wordings of the questions.

3.3 Reliability of the Research Instrument

According to [56], reliability measures the consistency of instruments when used at different points in time. This means that a reliable instrument must measure the same parameter over time. Thus, a reliability test was also conducted to determine the internal consistency of the items after the content validity was performed by the experts. Internal consistencies on individual basis attained through acceptable Cronbach's alpha values is the major criteria for adopting instruments from previous studies [57]. Thus, the Cronbach's alpha reliability coefficients for all constructs of this study were determined. [56] argued that thirty (30) or more samples are sufficient to conduct a pilot test. This study thus used 30 respondents for this pilot study. The result of this pilot testing (using Cronbach's Alpha value) is summarized in Table 1.

4.0 DISCUSSION

This study presents a framework that combines organisational innovativeness and culture as antecedents to sustainable construction, using government support as the moderator. This proposed framework is developed through a thorough review of literature to provide a deep understanding to both the academics and industry practitioners on the antecedents of sustainable construction and the moderating effects of government support on the established link.

Table 1 presents the Cronbach's alpha coefficient for all the constructs used in this study. The result of the pilot test analysis indicates that the Cronbach's Alpha of the variables ranges from 0.862 to 0.945. According to [58] and [57], the Cronbach's Alpha value that is greater than 0.7 is accepted; however, the value greater than 0.8 is preferable. In this study, the result of the internal consistency shows that the values of the Cronbach's Alpha for all the constructs are greater than 0.8, which indicates a very good reliability of the research instrument. Thus, no item was deleted on this basis. All items included in the instrument sufficiently proved to reflect on the fact that there is an adequate level of internal consistency following their respective

measure. This study's reliability result reveals that all the variables of this study are appropriate to be used in the main survey.

Comparing the Cronbach's alpha value in this paper with previous studies, for example, in [45], the Cronbach's alpha value for government support is 0.803 compared to 0.862 value recorded in this study, albeit a preliminary study. Again, [50]'s study recorded Cronbach's alpha value of between 0.736 and 0.848 in organisational innovativeness construct. Meanwhile, this study has a range between 0.894 and 0.932 for items of the same construct. However, further reliability analysis will be performed on the main data collected after the determination of the factor analysis on the main study.

5.0 CONCLUSION

This paper presents a framework on the antecedents and sustainable construction. It also presents the validity and reliability of the instrument that was administered among Malaysian largest contractors (the G7 contractors). The reliability result of this study indicates that all items included in the instrument sufficiently reflect an adequate level of internal consistency pertaining to their respective measures.

The framework in this study is essentially developed to determine the significance of organisational innovativeness and culture in achieving sustainable construction among Malaysian contractors. A major limitation of this study is that it focuses only on large contracting companies in Malaysia and the validity of the instrument obtained is at the preliminary stage. Therefore, future researchers are recommended to investigate the sustainable construction adoption by other construction SMEs and also endeavored to empirically validate the proposed framework in this study.

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