Journal of Advanced Research in Applied Sciences and Engineering Technology

Journal homepage:
https://semarakilmu.com.my/journals/index.php/applied_sciences_eng_tech/index
ISSN: 2462-1943

Validating the Effects of Organizational Internal Factors and Technology Orientation on Environmental Sustainability Performance of Malaysian Construction Firms

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ARTICLE INFO

Article history:
Received 3 December 2022
Received in revised form 12 April 2023
Accepted 20 April 2023
Available online 10 May 2023

Keywords:
Environmental sustainability performance (ESP); organizational internal factors; technology orientation; coercive pressure; affective commitment; Partial least squares – structural equation modeling (PLS-SEM)

ABSTRACT

The essence of emphasizing the importance of environmental sustainability among construction firms is to lessen the effects of construction activities or projects on the environment and make the construction activities more sustainably economically and friendly to the environment. This significant deliberation has stimulated various research interests by construction firms, owing to the damaging effects of construction activities such as various forms of environmental pollution, resource depletion, and biodiversity loss on a global scale. Using the Partial Least Squares- Structural Equation Modeling (PLS-SEM) approach, this study validates the environmental sustainability performance (ESP) as a construct from the perspectives of 186 construction firms within Peninsular Malaysia. An online cross-sectional survey was conducted where data was gathered from G7 construction firms through a well-structured questionnaire. Findings from this study revealed that organizational internal factors (Managerial attitudes, social responsibility, and company culture), and technology orientation have significant effects on the environmental sustainability performance (ESP) of Malaysian construction firms.

1. Introduction

There are growing indications that the earth's capacity to endure life as it has been known for thousands of years has been completely abused, predominantly since the industrial revolution, and if it goes unrestrained, will result in an irrevocable degradation of the planet, its ecosystems, resources and ultimately the quality of life of its populaces in the not-so-distant future [1].

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https://doi.org/10.37934/araset.30.3.150167

The swift economic and infrastructural development linked with modern forms of human survival have contributed to an over-misuse of renewable natural resources such as land and forests, and the exhaustion of non-renewable resources such as minerals and fossil fuels [2].

The generation of CO_2 emissions above the natural carbon storage capacity, weakening of the ozone layer, the contamination of water, air and land through pollutants, and the weakening of the whole ecosystem are also glaring [3,4]. These and many more are the construction industry's contributions to our ecosystem [5]. The usage of these generic resources (energy, water, land, and materials) lead to changes in the ecological structure of the biosphere [6,7]. Therefore, to constantly maintain the construction products and the built environment, the construction industry needs inputs from the earth's resources.

According to Abidin [8] these inputs are the materials for construction, including the embodied energy of materials used. The construction firms are major actors in the development of the built environment and should consider resource management as a crucial management tool to achieve reduction, reuse, and recycling of the non-renewable resources because these resources play a crucial role in the construction activities [8]. The construction industry is usually one of the major industries in both developing and developed nations in terms of investment, employment, and contribution to GDP [9-12]. Thus, the influence of the industry on the environment is projected to be substantial, principally because of the damage to soil and agricultural land, the loss of forests and wildlands, air pollution, and the loss of non-renewable energy sources and minerals [7,13,14].

In the construction industry, the role of buildings to total environmental catastrophe ranges between 12.42% of the eight main environmental irritant categories: use of raw materials (30%), energy (42%) water (25%), and land (12%) and pollution emissions such as atmospheric emissions (40%), water effluents (20%) solid waste (25%) and other releases (13%) [15,16]. According to Allouhi *et al.,* [17], Carfora *et al.,* [18], and Nejat *et al.,* [19], buildings and building construction services retains up to 66% of total UK energy consumption. A related level of energy consumption in the USA (54%) was cited by the International Energy Agency [20]. IEA further stated that the US residential sector is the highest consuming sector. Dadhich *et al.,* [21] projected that in the UK, the construction industry consumes about 6 tonnes of building materials yearly for every member of the population. In Malaysia, the construction industry is also categorized by high waste and low recycling quickly causing depletion of landfills, ever-increasing environmental pollution and adversely impacting on living conditions of Malaysians [8,13,22]. The above-mentioned figures support the belief that the construction industry inflicts substantial negative effects on the environment and the environmental effects harshly on almost every environmental issue influencing sustainability. The task for the industry is to re-organize its entire process to significantly reduce its influence on the environment.

Though, it was acknowledged in several pieces of literature that specific organizational internal factors and technology possess a relationship with environmental sustainability performance [6,23-32]. Thus far, the influence of these organizational internal factors and technology orientation on environmental sustainability performance within the construction companies in Peninsular Malaysia has not experienced significant attention. Therefore, to clarify these casual claims concerning the relationship among the organizational internal factors and technology orientation to the environmental sustainability performance, an all-inclusive framework is required which will integrate these variables using the mediating and moderating effects of institutional pressure and organizational commitment among Malaysian construction firms.

2. Literature Review

2.1 Environmental Sustainability Performance (ESP)

Construction projects are related to several environmental challenges that differ from one context to the other. These impacts include energy consumption, greenhouse gas emissions, land degradation, ecosystem destruction [8,13]. In recent decades, there has been swift urbanization in developing nations leading to the building and infrastructural development as one of the most crucial consumers of energy. As a result, the environment is repeatedly being stretched beyond its limits, and nations face the problem of providing infrastructure and housing that could meet up with the population's social needs in an environmentally friendly manner [33,34].

Environmental activists have also emphasized this form of a perfect society, where individuals live in peace without essentially devouring natural resources or demeaning the natural environment, such that they leave man-made and environmental assets behind them in almost equal amount as they are passed from previous generations [35,36]. Yet, the real world is far from this notion, as construction development is perhaps not only one of the resource-consuming industries, but also tend to obliterate the capacity to sustain it. The goal of tackling environmental sustainability challenges, thus, is to reduce its effects and make the construction activities more sustainable [6,8,37].

This is important because construction has harmful effects, such as different forms of environmental pollution, resource exhaustion, and biodiversity loss on a global scale [38,39]. There are several identified issues under environmental sustainability, and this necessitates the construction industry's influences on the immediate environment to be analysed from the "cradle to grave" standpoint, such that the construction industry could produce a healthy and toxic-free environment by devouring less renewable and non-renewable materials [39]. According to Aprianti *et al.,* [40] and Giljum *et al.,* [41], building and construction activities globally are accountable for 3 billion tons of raw materials yearly. This decline in resource consumption via efficient environmental planning, management, and control can detect the environmental risk and prevent water, ground, and air pollution [42,43]. In the long run, a design that is environmental-responsive is effective in accomplishing the goals of sustainable construction, as it promotes a healthy and safe atmosphere, energy efficiency, the use of environmentally friendly materials, as well as an eco-friendly environment [13,44].

In a related study, Lèbre *et al.,* [45] found that environmentally sustainable construction also embraces natural resource mining, which contractors and builders have little or no influence upon, but which they can discourage by calling for less finite natural resources, more recycled materials, and waste produced in other manufacturing processes, thus resulting in improved competition to produce more eco-efficient products. Many empirical studies that examined the factors prompting environmental sustainability performance of construction firms uphold the importance of harnessing firm resources and innovative technology as an inimitable way of accomplishing environmental sustainability in construction [33,46,47].

2.2 Organizational Internal Factors

In this study, organizational internal factors are conceptualized as managerial attitudes, the safety of employees, company culture, and social responsibility following [23,28,48-50]. Organization resources might be tangible or intangible and it can be a blend of the two or human resources. The tangible resources are organization assets like, equipment, land, capital, and labour. The intangible resources are those that cannot be seen physically by the organizations, like the internal factors in this study. While the human resources comprise the training and education of managers, team members, and the owners [51].

2.2.1 Managerial attitudes

Environmental sustainability has become a subject of growing concern. Problems associated with the environment, for instance, air pollution and biodiversity—have turned into serious issues for many stakeholders, including the government and business owners as well as individual consumers or clients [52]. Studies on environmental sustainability have reduced their attention on the significant elements of pro-environmental or green behaviours of individuals [53-57]. Such behaviours include actions that can safeguard the environment from the damaging impacts of human activities [18,58,59]. Environmental or eco-centric values may result in pro-environmental behaviour. Research on the psychological determinants of pro-environmental behaviour have recognized individual values as an important factor in certain pro-environmental behaviours for instance, recycling, energy conservation [18]. The extent to which top managers hold eco-centric values will likely affect their commitment to environmental sustainability in the construction industry [28].

Carfora *et al.,* [18] also emphasized the importance of environmental values in justifying pro-environmental effects in their hierarchical model. This paradigm alludes to the presence of underlying links between environmental values and the problem of awareness, personal norms, and pro-environmental behaviour. Those discoveries validated the projected causal relations among variables. As expected, environmental values positively affected awareness regarding environmental problems and a personal moral commitment to work to safeguard the environment.

A few researchers have investigated the direct effect of top management's environmental values on environmental performances [27,28]. However, they did not explain how environmental values transferred to environmental performances through other variables such as leadership. This is because environmental problems have become crucial, organizations have identified the vital role of leadership in tackling them [60]. Leaders set their sustainability policies or goals and apportion resources, directing all activities toward corporate objectives (including environmental sustainability). Basri *et al.,* [22] depicted management as a crucial force in corporate environmentalism. Epstein *et al.,* [60] also highlighted the significance of leadership in creating and executing sustainability policy in addition to conveying corporate sustainability with internal and external stakeholders.

2.2.2 Company culture

A company's culture can be referred to as the pattern of shared values, beliefs, and agreed norms that shape conduct [61]. A company's culture that is amenable to development is one of the primary prerequisites for the innovative firm to be successful [62]. An organization's culture deals with a few aspects such as openness to R&D results, adaptability, and common trust [63,64].

Establishing a culture of sustainability requires a staggering methodology. Hence, changing culture starts with the top management team, however, these endeavours must be supplemented by effective practices that pervade the whole firm [65,66]. For instance, a firm's values, goals, and policy can assist in sending signals to internal and external partners about the goals and direction of the firm. Thus, the standards utilized for employment and promotion can as well pass on to workers the kinds of actions that will be compensated. Lastly, the substance and methods of correspondences, personnel training, and the management's performance processes, all help the tactical initiative of making a culture of sustainability.

Consequently, to become sustainable, it is claimed that firms ought to significantly change their values and beliefs, drastically upgrade their culture and institutionalize environmental sustainability strategies into their organization [59,67-71]. Jizi [68] propose that an organization's values and culture differ according to the level of aspiration for environmental sustainability, and the "dominant value systems can determine the potential for sustainability".

2.2.3 Social responsibility

Sustainability has turn out to be the strategic priority of the new millennium. The phrases "sustainability", "social responsibility", "corporate social performance", "going green" and the "triple bottom line" all refer to organizations improving their long-standing economic, social, and environmental accomplishment [72,73]. There is an increasingly growing number of literatures emphasizing the significance of sustainability to a firm and its constructive influence on performance. For instance, the firms listed in the "Dow Jones Sustainability Index" and the "FTSE4 Good Indexes" shown share price performance better to that of firms listed in broader indexes, and firms belonging to the "World Business Council for Sustainable Development" outclassed their stock exchanges by 15-25 percent over a three-year period [71]. A recent survey of business leaders revealed that less than four percent of managers examined deemed being socially and environmentally responsible to be a "waste of time and money" [31].

Without a meticulous endeavour to make firms' infrastructure that supports the development of sustainability strategies, the firm's efforts to effective implementation of sustainability strategies will be cruelly stalled. Employee commitment to their firm's sustainability efforts can also lead to community citizenship behaviours [67]. Examples of this include Hershey, who support its employees for volunteering in their local community. Also, as part of "Solo's Sustainability Action Network", over 300 employees partook in more than 45 recycling, education, and beautification activities in the USA and Canada. Through the network, volunteers discover local or across the company projects and lead the way in executing them. Likewise, Alcoa employees volunteer in their local communities through the "Alcoa Green Works" initiative to support environmental developments and celebrate eco-holidays like "Earth Day", "World Environment Day" and "Arbor Day" [74].

Finally, according to a survey from General Mills [75], 82 percent of the company's US employees opt to volunteer either through company programs or freely, and almost 60 percent of the employees expend up to 5 hours a month serving in their respective communities.

2.3 Technology Orientation

As a result of technological advancement and the shortening life cycle of products and services, firms have been compelled to boost their technological capability to compete in their industries [76,77]. Technology orientation is described "as one where firms have an R&D focus and emphasize on acquiring and incorporating new technologies in product development" [78]. Technology orientation can also be defined as openness of firms to new concepts and their predisposition to embrace new technology during the development of products [59]. Technological orientation (often referred to as innovation orientation) is present when organizations implement new ideas, products, and processes. This is done by managing the firm's structure, system, and resources with technology and using this technology as a competency [27,79].

The construction industry in Malaysia has undergone accelerated evolution, propelled by technology and innovation. Several factors are considered in the industry - ways to construct faster and better while improving cost efficiency and sustainability [80]. CIDB's proactive measures resulted in identifying and promoting proven systems - Industrialized Building System (IBS) and Building Information Modelling (BIM) [6,80]. Therefore, in this study, TO is conceptualized as technological capability, top management capability, commitment to learning (learning) and commitment to change (unlearning) following Halaç [81].

2.3.1 Top management capability

Strategic orientation is expected to be in the framework of the general corporate strategies as well reflecting the firm culture [82]. Thus, a technology-oriented firm is required to comply with the vision and mission of the firm. Hence, according to the firms' strategic orientation, top management should resolve on whether to develop technology internally or acquired from the outside; to what level to invest on R&D; to compete or to cooperate with the competitors; which other way is the best for the firm now and in the future [83,84]. Likewise, guaranteeing the firm's businesses are done with up-to-date technologies and deciding on R&D investment amounts and directions, thinking about possible plans are also management's obligation [83,85].

The main source of being competitive is attached to top managements' capability of blending other organizational capabilities and competences to adjust to the fast-changing environment quickly [86-88]. Additionally, technically trained managers and/or managers that work together with technical/technological operations significantly are more likely to incorporate technology into strategic decision-making [81]. Managers create differences in how they see the environment, evaluate the options, and the decisions they made. In terms of a new product development perspective, because no innovation can be produced in a space, top management backing, and resource commitment have paramount significance.

2.3.2 Technological capability

Technology is projected as a firm's most important core capability [49]. Technology assets are in the middle of competitive advantage because combinations of a variety of technological resources provide hard to duplicate and unique positions [89]. Hakala [89] study asserts these "specific technology resource combinations" as technological capability. Technological capability is "a set of pieces of knowledge that comprises both practical and theoretical expertise, methods, procedures, experience and physical devices and equipment." This capability is strongly related to product, design, process, and information technologies. Kim *et al.,* [49] defined technological capability as "a set of operational abilities, manifested in the firm's accomplishment via numerous technological activities and whose greatest objective is firm-level value management by developing difficult-to-copy organizational abilities".

The vigour of technological capability hinges on how efficient the elements of the capability have been bundled. Therefore, those elements, namely R&D commitments and expenditures, technical abilities of personnel, and how to improve these skills particularly by training to increase technological capability endowments are appeared to improve this capability [81,90]. Firms that intend to achieve competitiveness by technology-based product innovation must have a strong technological capability [81,89,91]. A firm's technical skills, R&D resources, and technological support are also perceived to be the vital factors that create competitiveness through innovations [92].

Song *et al.,* [93] stressed that technological capability allows an organization to enhance production processes while decreasing costs. Firms that use technology must tactically develop or recognize technology-based prospects for dealing with the environment in a way to realize their strategic vision [81,84].

2.3.3 Commitment to learning (Learning)

The fields of strategic management consider organizational learning as one of the standard resources of competitive advantage and organizational performance [13,41]. Organizational learning is described as a process of creation, procurement, and integration of knowledge targeted at the development of resources and competencies that lead to better organizational performance [10]. Learning at an organizational level is an organizational competence that provides intuition and understanding from experience through investigation, observation, analysis, and a commitment to examine both successes and failures; then act in response to that learning [85]. The ability to understand faster than competitors is understood to bring competitive advantage [10].

Learning is the process that turns resources into useful, rare, unique, and non-substitutable capabilities by practices and repetition. During this process, skill and transforming every bit of information to the enduring corporate knowledge was highlighted [81]. Organizational learning is largely debated as a blend of four processes. These are knowledge acquisition via external and internal sources, information dissemination among members, information clarification to achieve a common understanding, and organizational memory which aims to store amassed knowledge to be able to make use of when needed. In a competitive environment, gathering information from the inside of the organization along with outside of the industry would probably provide a clear and broad perspective to where and how to employ technology-based in solving environmental suitability challenges.

2.3.4 Commitment to change (Unlearning)

As an important process that accelerates new learning/knowledge creation/innovation/technology production, unlearning (a) is concerned with deleting/shedding knowledge, (b) can have a peculiar value connected to it such as irrelevant, obsolete, etc., and (c) can either be an end by itself or act to an end learning or change [95]. Unlearning has three components: cognitive- to get new knowledge, behavioural – the changes in schedules, and normative- removing all unwanted routines from organizational memory [96].

Unlearning is a process where “organizations changed their cognitive structure, mental model, dominant logic and core idea to realize the relocation of organization value, norms and practices” [80]. “As much as change is about adjusting the new, it is about separating from the old” [96]. Therefore, to apply unlearning, commitment to learning, and commitment to change may appear to be required. Nonetheless, it is not comfortable for people to dispense with their current and deep-rooted beliefs and practices in organizations.

Unlearning has to do with deliberately eliminating something which is deep-rooted in an organization’s routines, memory, and beliefs. This process is appeared to be a prerequisite for learning new things. Leaving behind usual practices/strategies, previous methods/approaches, which are hindering the new approaches to learning, is also judged as organizational competitiveness [97]. However, collective memory can lead to apathy and can limit future changes. For example, with a poor track record/history of a new technology application prompting people the unproductive efforts and time during the earlier technology implementation, is connected to people’s feelings/expectations.

3. Methodology

This study adopts a cross-sectional survey research design wherein data was obtained from 185 representatives of construction firms (comprises of top or middle management level who are involved in the day-to-day running of the firm as well as taking strategic decisions about how the firm are been run like CEO, Executive Director, Managing Director, Construction Managers, and Project Managers) operating among the local, national and multinational construction firms within Peninsular Malaysia. Those representatives were selected as suitable respondents for this study following the recommendation of Bamgbade *et al.,* [13] and Adeleke *et al.,* [98] that they are the best people who have the idea of what environmental sustainability is all about in construction firms. Furthermore, a proportionate cluster random sampling technique was used in this study to select respondents from a sample frame of the construction firm's representatives.

To validate the environmental sustainability performance in the context of the Malaysian construction industry, the PLS measurement model was used to ascertain the individual item reliability, internal consistency of reliability, content validity, discriminant validity, and convergent validity of all the constructs in this study as shown in Figure 1 [13,98-101]. Before the pilot study, the instruments' content validity was conducted which represents the level at which the dimensions and items of the constructs in this study have been defined and measured [53,100]. This involved consulting experts (both from the academics and industry) to ascertain the validity of all the items. Consequently, this study item was sent out to ten experts who are acquainted with the constructs of this study. Their suggestions were fused into the final draft of the study instrument.

4. Results

This study seeks to know the demographic profile of the respondents in the sample as shown in Table 1 below. The demographic characteristics observed in this study comprise positions in the company, years of experience, and gender. The study found that 14.6% (27), 18.9% (35), 21.1% (39), 13.5% (25), 21.1% (39), and 10.8% (20) of the 185 respondents were Chief Executive Officer, Executive Officers, Managing Directors, Construction Managers, Project Managers, and others, respectively. Similarly, as for the working experience, where the highest percentage (47.0%) recorded was those whose experience was between 1 to 5 years, followed by respondents with more than 10 years of experience (28.6%), and 6-10 years (24.3%) in that order. Also, male respondents constituted 68.1% (126) and females 31.9% of the sample size. Furthermore, the firms' studied specializations were in residential buildings, non- residential buildings, social amenities, infrastructure, and others with 44.9%, 40.5%, 16.8%, 44.9%, and 13.3% respectively. The company ownership type is majorly local and foreign-invested enterprise with 84.3.0%, and 15.7% respectively while locations of business were local market areas, within a few states, regional, across Malaysia and international markets with 22.2%, 24.9%, 10.3%, 38.4% and 4.3% respectively while the company's employees strength range from <100 (68.1%), 101 – 250 (9.2%), 251 – 500 (4.9%) and > 500 (16.8%) within the sample framework.

Table 1
Demographic Characteristics of Respondents and Firms

Respondents	Frequency	%
Position in the company		
Chief Executive Officer	27	14.6
Executive Director	35	18.9
Managing Director	39	21.1
Construction Manager	25	13.5
Project Manager	39	21.1
Others	20	10.8
Gender		
Male	126	68.1
Female	59	31.9
Work experience		
1-5 years	87	47.0
6-10 years	45	24.3
More than 10 years	53	28.6
Company Age		
1-5 years	39	21.1
6-10 years	29	15.7
More than 10 years	117	63.2
Operational Location		
Local market areas	41	22.2
Within few states	46	24.9
Regional	19	10.3
Across the entire Malaysia	71	38.4
International market	8	4.3
Company Ownership		
Local	156	84.3
Foreign-invested enterprise	29	15.7
Joint Venture	-	-
Workforce		
<100	126	68.1
101-250	17	9.2
251-500	9	4.9
>500	31	16.8
Specialization		
Residential apartment	83	44.9
Non-residential apartment	75	40.5
Social amenities	31	16.8
Infrastructure	83	44.9
Others	25	13.5

4.1 Measurement Model

This study seeks to investigate the effects of organizational internal factors, and technology orientation on the environmental sustainability performance of Malaysian construction firms. The measurement assessment model used in the validation is shown in Figure 1 below.

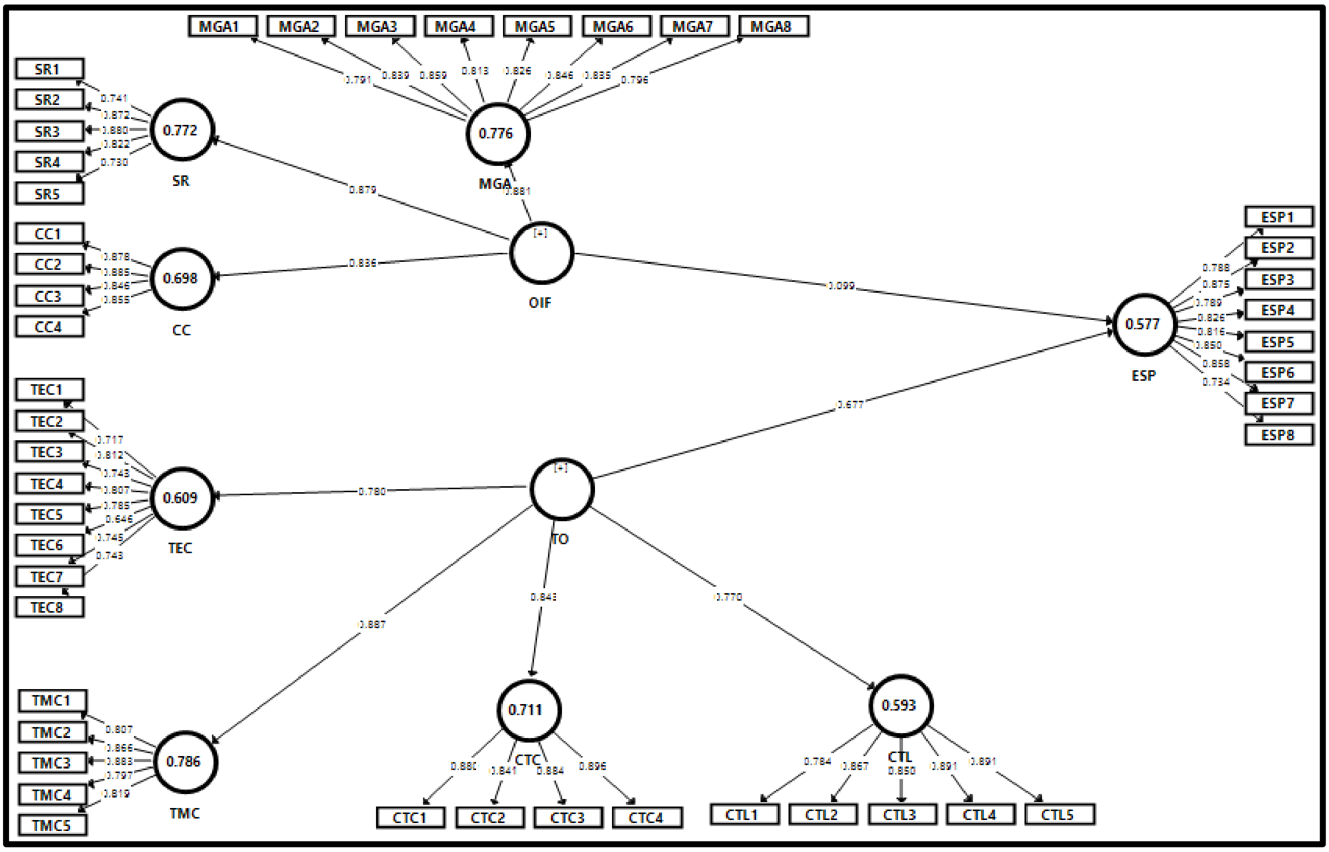

Fig. 1. Measurement model

4.2 Indicator/Item Reliability

The assessment of individual item reliability in this study was conducted by examining the outer loadings of each of the latent variables [102]. The first step in the assessment of the reflective measurement model involves assessing the indicator loadings. Loadings that are above 0.708 are recommended, as they signify that the construct justifies more than 50 percent of the indicator's variance, thus providing acceptable item reliability [100]. Table 2 below shows that all measurement items except TEC6 loaded above the recommended minimum threshold of 0.708 [103,104]. Nonetheless, items loading between 0.5 and 0.7 should be kept, if CR and AVE meet their required thresholds level and keeping them does not substantially impede model integrity [105-107]. Therefore, it can be accepted that all individual measurement items considerably added value to their studied constructs [104,108,109].

Table 2
Convergent and reliability analysis

Construct Dimension	Items	Loading	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Managerial Attitude	MGA1	0.791	0.933	0.945	0.682
	MGA2	0.839			
	MGA3	0.859			
	MGA4	0.813			
	MGA5	0.826			
	MGA6	0.846			
	MGA7	0.835			
	MGA8	0.796			
Social Responsibility	SR1	0.740	0.868	0.906	0.658
	SR2	0.871			
	SR3	0.880			
	SR4	0.823			
	SR5	0.731			
Company Culture	CC1	0.878	0.889	0.923	0.750
	CC2	0.885			
	CC3	0.846			
	CC4	0.855			
Technology Capability	TEC1	0.717	0.889	0.912	0.565
	TEC2	0.812			
	TEC3	0.743			
	TEC4	0.806			
	TEC5	0.785			
	TEC6	0.646			
	TEC7	0.745			
	TEC8	0.743			
Top Management Capability	TMC1	0.807	0.891	0.920	0.698
	TMC2	0.866			
	TMC3	0.883			
	TMC4	0.797			
	TMC5	0.819			
Commitment to Learning (Learning)	CTL1	0.784	0.909	0.933	0.735
	CTL2	0.867			
	CTL3	0.850			
	CTL4	0.891			
	CTL5	0.891			
Commitment to Change (Unlearning)	CTC1	0.880	0.898	0.929	0.766
	CTC2	0.841			
	CTC3	0.884			
	CTC4	0.896			
Environmental Sustainability Performance	ESP1	0.790	0.929	0.942	0.669
	ESP2	0.873			
	ESP3	0.786			
	ESP4	0.823			
	ESP5	0.816			
	ESP6	0.850			
	ESP7	0.859			
	ESP8	0.739			

According to Diamantopoulos *et al.,* [110] and Drolet and Morrison [111] reliability's values between 0.60 and 0.70 are considered "acceptable in exploratory research," values between 0.70 and 0.90 range from "satisfactory to good" while values of 0.95 and above are considered problematic, as they show that the items are superfluous, thereby plummeting construct validity. In this study, Cronbach's alpha (CA) and Composite Reliability (CR) ranged from 0.868 to 0.933 and 0.906 to 0.945 for all the constructs respectively which surpassed the benchmark of 0.7, thereby, affirming the internal consistency and reliability of all constructs. Also, the average variance extracted (AVE) for all constructs ranging from 0.565 to 0.766 which is higher than the threshold of 0.50, hence, signifying convergent validity for all the constructs [105,112].

To test for discriminant validity, the Heterotrait-Monotrait Ratio (HTMT) which was proposed by Henseler *et al.,* [113] as an alternative to Fornell & Larcker's method has been applied. The HTMT is advocated to be a superior boundary measure for examining discriminant validity. As an estimate for factor correlation, the HTMT should be considerably lesser than one (ideally<0.850) to distinguish between two factors [103,113,114]. The results of Table 3 below show a range between 0.421 and 0.881 which fall below the threshold of 0.90, hence implying all constructs are independent of each other and that the standard for discriminant validity is being met.

Table 3
Discriminant validity (HTMT)

	CC	CTC	CTL	ESP	MGA	SR	TEC	TMC
CC								
CTC	0.442							
CTL	0.421	0.643						
ESP	0.565	0.666	0.674					
MGA	0.583	0.607	0.573	0.645				
SR	0.881	0.559	0.441	0.595	0.667			
TEC	0.835	0.576	0.416	0.639	0.784	0.843		
TMC	0.541	0.792	0.67	0.732	0.709	0.625	0.652	

5. Discussions of Findings

The study validated the effects of organizational internal factors and technology orientation on the environmental sustainability performance of Malaysian construction firms. In general, the study's results show that the measurements for all the constructs comprising of managerial attitudes, social responsibility, company culture, technological capability, top management capability, learning (commitment to learning), and commitment to change (unlearning) with environmental sustainability performance are valid and acceptable measures of their constructs going by their parameter estimates. The findings also revealed that all the items measured were proper measures and reliable in explaining their constructs which explains the construct validity. This was established by the high outer loading of the items, CR, AVE, and square roots of the AVE for all the constructs which are consistent with the previous study of Bamgbade *et al.,* [13].

6. Conclusion

The study investigated the effects of organizational internal factors and technology orientation on the environmental sustainability performance of Malaysian construction firms. The study's results revealed that the measurements for all the constructs of organizational internal factors (managerial attitudes, social responsibility, company culture, and technology orientation (top management capability, technological capability, learning (commitment to learning) and unlearning (commitment to change) with environmental sustainability performance are valid and acceptable measures of their constructs based on their parameter estimates. The findings also indicated that all the measuring items are both reliable and good measures in explaining their respective constructs (which explains construct validity). This was evidenced by the high items' loadings, CR, and AVE for all the constructs.

Although this study has shown some understanding of the roles of organizational internal factors and technology orientation on the environmental sustainability performance of Malaysian construction firms, this is certainly not without limitations. First, since the study adopts a cross-sectional design, in which, the data collection procedure is "one-shot", "single-point-in-time", which precludes causal conclusions to be made from the study's population. Therefore, an alternative research design, a longitudinal design, is recommended for future research considerations. Secondly, this study offers quite limited generalizability as it focused mainly on large construction companies. Although, these large firms (the G7 construction firms) are observed to be more capable to adopt environmental sustainability practices and strategies than the SMEs construction firms who are inhibited due to their size and resource meagerness [6,115,116].

Acknowledgment
The research funding from the Fundamental Research Grant Scheme (FRGS) managed by PNI, University Malaysia Pahang [Grant code: RDU190127] is hereby acknowledged by authors of this study.

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