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A Construct Validation Approach for Exploring Sustainability Adoption in Pakistani Construction Projects

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Received: 13 October 2020; Accepted: 12 November 2020; Published: 18 November 2020

Abstract: Sustainable Project management (SPM) is a novel theme in construction industries of developing countries and very little is known (so far) about the sustainability performance of construction projects in those settings. Accordingly, the quantitative measurement of SPM as a higher-order construct is not well established and lacks a holistic approach and homogenous taxonomy of indicators. This study explores the SPM practices of construction firms by validating SPM as a second-order construct in the Pakistani construction industry. Data were obtained from 146 construction firms, which were then analyzed using partial least square structure equation modeling. Results of the first and second level measurement model assessments showed that construction firms practice SPM, with varying degrees of attention paid to three sustainability aspects. Environmental dimension surfaced as the most important, in-terms of practice and social sustainability as least. The analysis of the second-order measurement model yielded significant results, thus, validating the higher-order structure of SPM. This study contributes to the field by presenting one of the first studies of its kind by focusing on the sustainability practices of construction firms by using a higher-order design of SPM construct within the context of developing countries.

Keywords: construct validation; managing sustainability in projects; construction firms; higher-order construct; Pakistan

1. Introduction

The growing significance of sustainable project management (SPM) as a new school of thought in project management has triggered the influx of research studies related to managing sustainability in projects, with a prime focus on the construction industry [1]. The critical aspect included in those studies is how construction firms understand (and respond) to the operational consequences of SPM which is of vital importance for the overall transition of t construction industry towards sustainability [2]. Sustainability is an area that is well-discussed in the contemporary world and businesses are experiencing multifaceted pressures as well as incentives to adopt sustainable corporate practices for their long term survival and growth. The same applies to the construction industry, as it can significantly influence our economy, society, and environment [3]. In its essence, the sustainability concept calls for achieving a balance among the economy, society, and the environment. As agents of the construction industry, construction firms are receiving ever-increasing attention from scholars and academia due to their critical roles in implementing the sustainability agenda. Although, there are published studies available on sustainability in construction projects, yet an overwhelming majority of these studies take into account the design perspectives only while the process perspectives are undermined [4]. How a construction firm practically implements sustainability practices while delivering projects is of vital importance and, so far, very little is known about the sustainability practices of constructions firms, particularly those operating in developing countries. Another important aspect is that research on SPM is being reported, predominantly, from developed countries and very little is known so far about the SPM practices in developing countries which host almost 85% of the world's population [5]. Therefore, owing to the sheer differences found in socio-economic structure, culture, and prevalent resource scarcity, as compared to developed countries, a different approach for SPM is needed in those settings [6,7]. For instance, while developed countries approach sustainability in construction from a technology dominated perspective, this is unreasonable for developing economies due to the lack of technical know-how and resources. As a result, the literature on sustainable construction aptly suggests creating a body of knowledge on SPM in developing economies through context-specific conceptual (as well as empirical) studies [5,8]. On the other hand, the operational contours of SPM are debatable and there is diverse opinion found in the literature regarding the operational definitions of SPM, the measurement design of the construct of SPM and how to link it with well-grounded theoretical foundations. More research on these aspects would help in translating this important concept into achievable goals and objectives [5,9]. From a theoretical perspective, the extant literature on SPM encompass the three pillars of sustainability, also called the triple bottom line theory, which refers to addressing economic gains, social well-being, and environmental sustainability, all at the same time. However, empirical studies on how the concepts of sustainability are integrated into projects are limited in number and fragmented in terms of research designs adopted [10].

A review of the recently published literature in the field of SPM [11,12] shows that studies on integrating c sustainability into project management are mostly interpretive in nature [11–13], ascribing meaning to how the concepts of sustainability could be interpreted in the context of projects. Accordingly, these studies also recognize a research gap in terms of measuring sustainability in projects, primarily the generalizable empirical studies based on robust quantitative designs [7]. A logical condition for framework-based quantitative studies is the availability of a validated and reliable construct that could be used by researchers for framework-based empirical studies in future. In the context of SPM in construction, researchers have adopted heterogeneous and context-specific approaches for measuring SPM [14,15], where the construct design and taxonomy of indicators lack a holistic approach [16,17]. Moreover, research studies that have used triple bottom line framework to measure SPM seldom agree on the exact design of the construct, i.e., second-order single construct or three (or more) individual constructs [15,18,19]. Thus, in order to carry forward academic discourse on SPM in the construction industry, the study at hand aims to validate the three sustainability dimensions as a single higher-order construct in construction industry of developing countries, with a specific focus on Pakistan. Accordingly, this study approaches SPM from the corporate social responsibility (CSR) perspective, as discussed by Silvius and de Graaf [20], and adapts the CSR approach or construct design for gauging SPM practices in construction projects [21]. It also provides initial methodological insights into using SPM as a second-order construct by validating it in the context of the Pakistani construction industry. This study is not proposing an entirely new scale, rather it integrates the diverse approaches adopted by different scholars to measure SPM. It further advocates that the construct of SPM could be better measured when it is treated as a second-order construct, as suggested by Martínez et al. [21]. Further, this study aims to explore the project sustainability practices of construction firms operating in Pakistan using the confirmatory composite analysis technique, available with partial least square structure equation modeling. Existing e-literature reports on SPM cover the context of developed countries, whereas very little is known about SPM practices of firms operating in construction industries of developing countries. There is a scarcity of empirical studies with quantitative designs on SPM practices from those settings, particularly from Pakistan. An investigation into the current status of SPM adoption by construction firms in Pakistan will provide valuable insights regarding SPM implementation in the construction industries of developing countries.

2. Literature Review

2.1. Sustainable Project Management

In order to discuss (and properly understand) the idea of sustainability in projects, or, more precisely, Sustainable Project Management, it is important to understand what sustainable development actually means. The definition of sustainable development as stated in the document "Our Shared Future" [22], is the development that meets the needs of the present without sacrificing the needs of future generations. The ubiquitous definition is basically, focused on three dimensional integration, i.e., economic, environmental, and social sustainability, also well-known as the Triple-Bottom Line Similarly, scholars have shown a growing interest in Corporate Responsibility, including corporate financial responsibility, corporate environmental responsibility, and corporate social responsibility [5,23]. According to Marcelino-Sádaba et al. [4], projects managed with a sustainable approach is the most effective strategy to achieve the overall goal of corporate sustainability. Huemann and Silvius [24] asserted that sustainability in projects is an emerging and new "school of thought in project management", which is receiving unprecedented attention from scholars and practitioners alike. However, researchers also pointed out that sustainability considerations stretch the system boundaries of project management [25]. In academia, the concept of SPM is viewed as a novel theme that accommodates different multifaceted dimensions from the domains of project management and sustainable development. While the scope of project management is well developed in both philosophy and application, the definition of SPM is in evolutionary stage where its organizational implications are yet to be clarified and understood [18,26] The prevailing SPM models tend to vary in their approach, but usually aim to represent the core sustainability dimensions with varying coverage of the environment, inter-generational equity and compliance beyond regulation [13]. In addition, the core concept of SPM in the construction industry covers the themes like lesser utilization of natural resources [27], due diligence towards project externalities [28] and conservation of human (as well as ecological) capital [29]. These considerations led us to the definition proposed by Silvius [23], which states:

> "Sustainable Project Management is the planning, monitoring and controlling of project delivery and support processes, with consideration of the environmental, economic and social aspects of the life-cycle of the project's resources, processes, deliverables and effects, aimed at realizing benefits for stakeholders, and performed in a transparent, fair and ethical way that includes proactive stakeholder participation" [25].

In contemporary market scenarios, sustainable corporate practices are evolving as vital agenda items for the construction industry and its associated firms [30]. This sector has powerful economic, social, and environmental impacts and, hence, its sustainability is of vital significance in terms of achieving the overall goals of sustainable development [31]. From an economic perspective, the construction sector is a significant contributor towards employability by absorbing a bigger chunk of the labor force. On the other hand, construction projects are intrinsically irresponsible towards the environment and the community [32] as they involve extensive use of materials and energy. This significantly contributes to environmental degradation and disturbs the ecosystem [33]. Apart from this, construction work environs are unsafe, hazardous, and dirty [5,34]. Moreover, in order to compete in the highly competitive industry, construction enterprises tend to focus more on the returns of investments and profitability with lesser attention directed towards environmental protection or well-being of the labor force and communities [14,30,35,36]. All of these issues, though apparently different yet interconnected at an operational level, pose considerable challenges to project managers, while considering sustainability in construction projects. In order to fully comprehend the essence of managing sustainability in construction projects, a brief discussion on the three dimensions of sustainability management in construction projects, along with the issues encapsulated in each of them, is discussed in the below section.

2.1.1. Social Dimension

The social aspect of sustainability corresponds to the impact of corporate operations on different internal and external stakeholders [37]. According to Zuo et al. [11], the operationalization of social sustainability is still debatable with little consensus among the researchers. However, it is typically understood in terms of labor force welfare, empathy for the communities where the project is being executed and care for end users connected with the projects. This notion of welfare can be expressed as the efforts done for improving the quality of human health and social life, ease of access to the basic facilities, employment generation, conducive and safe work environs and conditions, provision of justice, supportive organizational systems, education, and training [38]. Most of these issues are technically interrelated and demand well-crafted strategies for their integration in corporate sustainability practices [39]. Furthermore, the social dimension is correlated with the other two sustainability aspects, i.e., environmental and economic dimension. This reveals the subtle complexities involved in the sustainable corporate practices and, hence, requires context-specific exploratory (as well as applied research) studies to be conducted [5]. In a project context, the social dimension basically encircles the three broader themes, i.e., welfare of the workforce, well-being of the community (where the project is being executed) and the end users of the project [37,40].

2.1.2. Environmental Dimension

Environmental dimension of sustainability is the most intensively investigated dimension among the other three sustainability dimensions, perhaps due to the construction industry's substantial role in destroying the natural environment and CO_2 emissions [41,42]. Environmental sustainability efforts predominantly focus on reducing the usage of non-renewable resources, while encouraging renewable energy sources and materials [43], developing mechanisms for controlling waste generation during project lifecycle and protecting the natural environment from destruction [44,45]. Most of these problems affect social sustainability as well [46]. For instance, the pollution emanating from construction activities is harmful for the health of both the labor force as well as the adjacent communities [47]. On the other side, a systematic decrease in the consumption of resources and reusing or recycling of the wastes generated during the project's lifecycle will ultimately result in preservation of the ecology and its resources for future generations [46,47].

2.1.3. Economic Dimension

Economic sustainability has arguably been pursued by all kinds of organizations in order to survive in competitive market environments [48]. However, in the context of SPM in construction, it actually calls for sharing wealth with wider stakeholders for their long term well-being while pursuing short-term shareholders returns [49]. Economic sustainability is deeply entangled with the other two dimensions of sustainability. Despite a preliminary cost premium, environmentally and socially sustainable construction practices tend to be economically sustainable as well [50] as they lead towards greater value and benefits in the long run. Clients reap the benefits by getting better lifecycle value for their investment, contractors enjoy improved profits from operational efficiency, i.e., reduction in waste and, hence, costs. Finally, the community at large benefits from enhanced employment opportunities and the investment in human capacity building [5].

While developed countries pay attention to manage sustainability issues in construction projects, developing countries have shown negligence in fulfilling sustainability requirements in construction activities. The predominant trend towards economic performance in those settings have given rise to huge and urgent need for construction works, such as infrastructure and housing projects. As per literature evidence, these massive construction activities have undermined the core sustainability concerns [7]. In a similar vein, Pakistan, which is a developing country, is facing critical sustainability challenges from diverse fronts. Among other sectors responsible for this situation, the construction industry ranks higher in the list. This sector is intrinsically negligent towards social and environmental sustainability, particularly in mega construction projects [51,52]. Furthermore, rising CO_2 emissions and related climate change issues have visible effects on the country, particularly on its communities inhabiting northern mountainous regions. To exacerbate the situation, a series of construction projects have been started under the grand economic revival program called Pakistan China Economic Corridor [53]. This program bears substantial strategic value for Pakistan with heavy investments in energy and infrastructure projects form the neighboring country of China [54,55]. These mega projects will definitely add value to the country's economy, yet they are simultaneously triggering adverse environmental and social sustainability issues. Contrary to the appealing narratives [56], there are adverse effects too, and appropriate remedial actions are duly needed to counter the sustainability risks associated with the construction projects under this initiative. Negligence on this front would be detrimental for Pakistan in terms of CO_2 emissions, thereby worsening the country's rank in the global climate risk index, once these mega activities are concluded [57]. This situation needs a critical audit of the sustainability-management mechanisms employed by Pakistani construction firms. Empirical evidence through customized research studies will further our current understanding of SPM practices in those settings [52,58,59].

2.2. *Measuring SPM as Second-Order Construct*

Although projects are considered to play a critical role in the sustainable management of organizations and human society, the scholarly literature on managing sustainability in projects is still in its infancy [4,60]. The main discourses in SPM have rapidly shifted from identifying the significance of SPM towards the strategic level consideration of sustainability in project management practices [60]. However, the extant literature offers limited insights on the integration perspective and more empirical evidence is, therefore, needed to explore the implications of SPM, studying it juxtaposed with well-grounded theoretical frameworks. A review of the literature published by leading authors in the field of SPM highlights the fact that few studies, till date, have actually attempted to explore the construct of SPM using framework-based quantitative designs [13,16,61]. Instead, the predominant majority of these studies include a qualitative case study method or systematic literature reviews. Amongst those, the first category includes studies that exclusively confine their focus on elucidating the contours of the newly emerging field [62], followed by the studies that were dedicated to operationalize the concept with suitable underpinning theories [15,63,64]. The third category includes very few research studies that are pivotal around the triple bottom line theory and that have used empirically grounded frameworks supported by the existing literature [16,18]. From among those studies that involved quantitative designs, the work of Silvius and Schipper [15] and Carvalho and Rabechini Jr [18] distinctively outlined and elaborated the need to use the construct of SPM as a second-order hierarchical construct, so as to fully capture the essence of the triple bottom line theory in the context of construction projects. The measurement indicators included in these studies explicitly refer to the three dimensions of sustainability, i.e., economic, environmental, and social. However the measurement strategies are yet, again, diversified, in terms of identifying the exact numbers and nomenclature for latent constructs [18]. This diversified approach provides cushion for researchers to further explore the measurement strategies of SPM with support from similar domains. Such efforts will add more rigor and value to future studies on SPM with quantitative designs

There are a good number of studies available on sustainable corporate practices conducted in domains such as manufacturing, where the research frameworks treated sustainability construct as a group of three variables being measured individually. For instance, the studies of Masocha and Fatoki [65], and Yusliza et al. [19] measured the sustainability performance of manufacturing firms with three individual constructs rather than one single higher-order construct. All of these, as well as other similar studies, were either concerned about the discreet nature of individual constructs, or might simply have avoided it, owing to certain measurement challenges associated with higher-order constructs [66]. For instance, the literature reports that evaluating the measurement quality of higher order constructs are highly challenging, especially in terms of measuring validity and reliability. Besides, authors erroneously interpret the relationships between higher-and lower-order components as structural model relationships [67]. However, these challenges have been properly and thoroughly addressed in recent studies and it is now increasingly being recommended by researchers to opt for higher-order constructs due to several advantageous features [68]. For example, it helps to reduce the number of path model relationships, thereby achieving model parsimony. Where, instead of specifying a web of relationships between multiple independent and dependent constructs in a particular path model, the researchers can encapsulate the individual constructs in a higher-order construct formation. This will render the relationships between the (then) lower-order constructs in the model obsolete. Another significance of these constructs is that they help to overcome the bandwidth-fidelity dilemma, according to which there is a trade-off between variety of information (bandwidth) and thoroughness of testing to obtain more certain information (fidelity) [67]. Lastly, forming a higher-order constructs helps in reducing collinearity among the formative indicators, which is done by re-arranging the particular indicators and/or constructs across different concrete sub-dimensions of the more abstract construct [69]. However, it is emphasized in the literature that the conceptualization and specification of higher-order constructs needs to be well-grounded in properly developed measurement theory. At a very basic level, researchers need to have complete information about setting the measurement model specification of the lower-order constructs. Parallel to this, the nature of relationship between the higher-order latent and its corresponding lower-order constructs need to be sorted, both of which could be reflective or formative in nature [70].

In light of the discussions made above, this study adopted the second-order construct approach to measure the construct of SPM with support from the previous literature, especially referring to work of Martínez, Pérez [21] in the domain of corporate social responsibility. Generally, in the corporate sector, the sustainable practices are categorized under the term corporate social responsibility, using the triple bottom line theory as f theoretical point of reference [71]. Moreover, recent studies have also referred to, and borrowed from, the domain of corporate social responsibility, while elaborating sustainability in the context of project management [20]. Therefore, the established second-order measurement scale, premiered in the those studies, can also be a valid and reliable starting point for measuring SPM, with indicators adapted from other, similar studies. In this background, the prime objective of the study is to validate the construct of SPM as a second-order reflective-reflective construct in the Pakistani construction industry, using the novel method of confirmatory composite analysis available with partial least square structure equation modeling.

3. Methodology

A full scale survey was conducted in the Pakistani construction industry to collect data for a broader study, of which this study at hand is a major part. Unit of analysis was an individual firm. The firm details were collected from the website Pakistan Engineering Council (PEC) through stratified random sampling. The PEC registers construction firms, broadly, under eight categories, i.e., CA, CB, C1, C2, C3, C4, C5, and C6. The category rankings are hierarchical; each firm is eligible to get a contract up to a certain level of financial worth. All of these firms are eligible to get any sort of construction project, be it a building construction or an infrastructure development project, if they possess the required capabilities, measured through the technical codes acquired from the PEC. Four top category firms i.e., CA, CB, C1, and C2 were treated as four strata for this study, as they were all eligible for getting medium to mega-level construction project contracts. Moreover, all of these categories were bound by regulation to have a minimum of two (or more) professional project managers with a sound project-related work experience. This helped in reaching out to the most relevant firms in terms of capability and past experience.

The data collection strategy allowed one response/per firm only. The survey was created using Google Forms, and the survey link was sent via email to selected firms in order to solicit the response of senior project staff (project manager or director). The research design included ex-post facto analysis, where the respondents were supposed to respond using information from already completed projects. The sample size was determined by G*Power [72], considering statistical significance level (5%), power level (90%) and effect size (15%) [73]. The sample size generated by the software was 88 firms. Due to the contextual research findings, in terms of response rate, as well as considering the pilot study results, 400 hundred firms were selected (random numbers generated out of 1162 total firms, in SPSS 21.0 (IBM Corp., Armonk, NY, USA) to acquire an appropriate response. Out of these 400 firms who were contacted via email that contained a link to the survey, 146 large construction firms participated by filling in the survey form, which makes a response rate of 36.5%.

A formal questionnaire was developed and observed variables (measurement items) were adapted from published literature, as mentioned in Table 1 [21,74,75]. A five point Likert scale, with 1 denoting no agreement and 5 meaning full agreement, was used to measure the questionnaire items. SPM was taken as a second-order (reflective-reflective) multidimensional construct, defined by certain numbers of first-order complementary latent variables, i.e., environmental sustainability (ENS), economic sustainability (ECS), and social sustainability (SOS). The second-order design of the construct implies that all first-order latent variables are important, yet complementary embodiments of SPM, and are theoretically consistent with previous studies. The first version of the questionnaire was submitted for the face validation in order to maintain consistency and representativeness of the constructs studied. Two project managers and three independent researchers checked face validity of the research instrument.

Table 1. Questionnaire items.

Construct	Observed Variable	Reference
Economic Sustainability Projects	Return on investment/profitability Focusing on long-term success Improved overall economic performance Competitive potential/success in the long run	[21]
Environmental Sustainability in Projects	Concern for environment Resource utilization Treatment of waste EPA * regulations Renewable energy Emissions and hazardous material Environmental audit	[21] [74]
Social Sustainability	Care for communities Health and safety of communities Well-being of employees Concern for occupational health and safety of employees Protection of the claims and rights of people in the community served A role in society that goes beyond mere profit generation	[75] [21]

* Environmental protection agency.

Partial Least Square Structural Equation Modeling with an exclusive focus on confirmatory composite analysis (CCA) was selected as the data analysis technique. The software of SmartPLS 3.2.8 [76] which is a second-generation data analysis tool, was used for analyzing both the first-order and second-order measurement model of the study, as per recent guidelines available in the literature [67]. The confirmation of measurement model, at both levels, would result in the construction validation of SPM as a second-order construct. The method of confirmatory factor analysis has traditionally been used to validate the reflectively measured constructs as compared to the confirmatory composite analysis, which is relatively a novel alternative approach [77]. It is basically an integral component of partial least squares structural equation modeling for confirming the measurement models [78]. From a methodological perspective, it refers to a sequence of steps duly executed in partial least square structure equation modeling to validate both reflective and formative measurement models for established measures which are being adapted to a different setting. Moreover, it is useful for developing new measures as well. Finally, this technique offers various practical advantages over other techniques or approaches aimed at confirming a measurement model consisting of linear composites [79,80]. While the techniques of exploratory factor analysis and confirmatory factor analysis are well-known in the extant literature, this novel approach for assessing measurement models and construct validation is an emerging practice [79–81]. In recent years, researchers have started referring to the measurement model assessment step in partial least square structure equation modeling as a confirmatory composite analysis, which is finding traction in literature as a robust technique. It works through a sequence of connected steps implemented with partial least square structure equation modeling, to evaluate both the reflective and the formative measurement models [77].

4. Results and Analysis

4.1. Preliminary Data Analysis

In terms of descriptive statistics, we received the highest response (45.2%) from firms registered in the C2 category, and the least response (11.6%) from the CB category. The responses received were mostly from those who were project managers (62.3%), but very few were project directors (32.2%). We also received some responses (5.5%) from program managers. The educational background was not very diverse, as the majority of project managers/director (72.6% in total) had bachelor's degrees. This is a very common feature in the Pakistani construction industry, as individuals with four-year bachelor's degrees are eligible for becoming project managers. The average project-based work experience of respondents was calculated as 13.4 years. Moreover, before proceeding towards analysis, the received data was submitted for the normality test using the online software, accessed through the link, https://webpower.psychstat.org/models/kurtosis/, as suggested by Cain, Zhang [82]. The results showed that the Mardia's coefficient of multivariate skewness was 1.570 (t = 38.219, $p < 0.01$) and kurtosis was 14.956 (t = −0.0418, $p = 0.096$), indicating that data was not normal. The results of the normality test supported the use of partial least square structure equation modeling, which effectively deals with data that do not fulfill the normality conditions, otherwise necessary with variance-based structure equation modeling.

4.2. Construct Validation

Construct validation is ascertained in partial least square structure equation modeling by confirming the measurement model for any construct using a series of steps, i.e., assessing indicator reliability, composite reliability, convergent validity, and discriminant validity.

4.2.1. Indicator Loadings

The basic objective in determining the indicator reliability is to assess the individual items that converge to constitute a particular construct. Standardized loadings should have a value of at least 0.708, and an associated t-statistic above ±1.96, to be significant for a two-tailed test at the 5% level [83]. The t-statistics were obtained by executing a bootstrapping procedure with 5000 subsamples, which confirmed that all of the indicators were significant with loadings above 0.708, except for one item, i.e., ENS7, a After deleting this item, the model was reassessed to get the final results. The item loadings obtained by re-calculating the model revealed that the remaining items met the standardized loading value of 0.708, [84], indicating that the measures were individually valid. The indicator loadings are shown in Table 2.

Table 2. Indicator loadings.

Constructs	Items	Loadings
ECS *	ECS1	0.892
	ECS2	0.850
	ECS3	0.886
	ECS4	0.901
ENS **	ENS1	0.840
	ENS2	0.770
	ENS3	0.802
	ENS4	0.819
	ENS5	0.796
	ENS6	0.776
SOS ***	SOS1	0.811
	SOS2	0.784
	SOS3	0.8
	SOS4	0.802
	SOS5	0.783
	SOS6	0.739

* Economic Sustainability, ** Environmental Sustainability, *** Social Sustainability.

4.2.2. Internal Consistency Reliability

In order to measure internal consistency reliability, this study used the values of Cronbach's alpha and composite reliability. The minimum acceptable value for Cronbach's alpha is 0.70; below this value, the internal consistency is considered low. Similarly, a measurement model is considered to have adequate internal consistency reliability when the composite reliability of each construct exceeds the threshold value of 0.7. Table 3 shows that the Cronbach alpha and composite reliability for each construct is above threshold value.

Table 3. Internal consistency reliability.

Constructs	No of Items	Loadings	Cronbach's Alpha	Composite Reliability
ECS	4	0.850–0.892	0.905	0.934
ENS	6 *	0.770–0.840	0.888	0.915
SOS	6	0.739–0.811	0.877	0.907

* one item deleted due to lower loadings.

4.2.3. Convergent Validity

To evaluate convergent validity of reflective constructs, researchers considered the outer loadings of the indicators and the average variance extracted (AVE). The outer loadings of a construct help to determine the average variance extracted when they all are statistically significant. It is because a significant outer loading might still be fairly weak, therefore, the standardized outer loadings of a construct should be 0.708 or higher. When the outer loadings of a construct fulfil this requirement, it helps to achieve the significant AVE values of a construct. Moreover, the convergent validity is considered adequate when constructs have an average variance extracted (AVE) value of at least 0.50 or more. Table 4 shows that all constructs of this study have AVE ranging from 0.619 to 0.779, which basically exceeds the recommended threshold value of 0.5.

Table 4. Convergent validity.

Constructs	No of Items	Loadings	AVE
ECS	4	0.850–0.892	0.779
ENS	6	0.770–0.840	0.641
SOS	6	0.739–0.811	0.619

4.2.4. Discriminant Validity

Discriminant validity determines the extent to which a theoretical construct can be distinguished from other constructs included in a study, using empirical standards. Therefore, when the discriminant validity is established it implies that the particular construct being evaluated is empirically unique and captures a phenomenon that is not depicted by any other constructs in a specific model [85]. This study determined the discriminant validity using the three available criteria, i.e., cross-loadings, Forner and Lacker criterion, and Heterotrait–Monotrait ratio.

- Cross Loadings

Generally, the outer loadings of a construct are considered to be the first method to assess the discriminant validity of a construct's indicators. Moreover, the outer loadings of an indicator on the intended construct must be greater than any of the cross-loadings on other constructs. Table 5 shows that, for this study, the cross-loading values of all the constructs are lower than their loadings on the intended constructs.

Table 5. Cross-loadings.

	ECS	ENS	SOS
ECS1	**0.892**	0.703	0.452
ECS2	**0.850**	0.587	0.260
ECS3	**0.886**	0.677	0.364
ECS4	**0.901**	0.680	0.346
ENS1	0.708	**0.840**	0.498
ENS2	0.524	**0.770**	0.442
ENS3	0.569	**0.802**	0.537
ENS4	0.667	**0.819**	0.475
ENS5	0.508	**0.796**	0.478
ENS6	0.625	**0.776**	0.395
SOS1	0.545	0.615	**0.811**
SOS2	0.200	0.355	**0.784**
SOS3	0.218	0.367	**0.800**
SOS4	0.368	0.491	**0.802**
SOS5	0.240	0.457	**0.783**
SOS6	0.256	0.431	**0.739**

- Fornell–Larcker Criterion

The Fornell–Larcker (F and L) criterion is yet another traditional approach to evaluate the discriminant validity. It actually compares the square root of the AVE values with the latent variable correlations. In order for the F and L criterion to be achieved, the square root of each construct's AVE should be greater than its highest correlation with any other construct. Table 6 shows this study fulfils the F and L criterion for determining discernment validity.

Table 6. Fornell–Larcker criterion.

	ECS	ENS	SOS
ECS	0.883	-	-
ENS	0.752	0.801	-
SOS	0.408	0.589	0.787

- Heterotrait–Monotrait Ratio (HTMT)

Until recently, researchers relied on cross-loadings and Fornell–Larcker criterion for assessing the discriminant validity. However, Henseler, Ringle [77] proposed a third criterion known as HTMT for better results, which is duly supported by the recent research studies. According to recent literature, both of the old approaches faced challenges in terms of detecting the discriminant validity issues. Specifically, the cross-loadings approach failed to specify a lack of discriminant validity when the two constructs in a model were perfectly correlated. It reduces the effectiveness of the criterion for the empirical research with quantitative designs [77]. Similarly, the Fornell–Larcker criterion performs below par, particularly when indicator loadings of the constructs under consideration differ only slightly [86]. As a remedying measure, Henseler et al. [77] recommend assessing the discriminant validity using HTMT for better results. The cut-off scores of 0.85 and 0.90 are used by the researchers to interpret the HTMT results. The Table 7 shows that the HTMT results for this study are below the cut-off value of 0.85. HTMT criterion for establishing discriminant validity is fulfilled when the HTMT value is lower than 0.90. As shown in Table 7, the values for all constructs are lower than 0.90, which depicts the presence of acceptable levels of discriminant validity.

Table 7. Heterotrait–Monotrait Ratio (HTMT) criterion.

	ECS	ENS	SOS
ECS	-	-	-
ENS	0.833	-	-
SOS	0.429	0.650	-

4.2.5. Assessing Second-Order Construct

The recommended approach for assessing second-order construct in partial least square structure equation modeling is "repeated indicator approach". Therefore, following the guidelines [67,69], SPM was calculated as second-order reflective (both first and second level). The reliability and validity results for second-order SPM analysis is shown in Table 8. The values of first order item loadings, CR, and AVE demonstrate that the second-order construct validation has significantly been established.

Table 8. Reliability and validity assessment for second order construct.

Construct	Items Loading	CR	Ave
SPM	0.930 0.782 0.835	0.89	0.724

5. Discussion

The validation of any higher-order theoretical construct in partial least structure equation modeling is considered to be accomplished if the validity and reliability criteria for first and second-order latent constructs are met successfully. This finding of this study shows that these two conditions were fulfilled, as shown in Tables 1–7. Therefore, it can be inferred from the results that the construct sustainable project management (SPM) is statistically valid and helps to form a parsimonious model in measuring the three different dimensions of sustainability simultaneously. As discussed in the introductory section, the concept of SPM is gaining momentum in literature, as well as in practice. However, studies appearing in the literature are reporting the situation of SPM from developed parts of the world, with little insight on the situation of SPM in developing countries. In general, the need for rapid economic development has fueled the demand for construction projects in developing countries, which in turn has overshadowed the sustainability aspects. Thus, the construction industry in developing countries is lagging behind in terms of integrating sustainability into key project management practices [7]. SPM is gaining momentum in literature, and the number of articles on this subject have been rising consistently over the years, where a substantial chunk of the studies (more than 60% of published articles) have emerged from developed countries [5]. This trend needs to be reversed as 85% of the world's population live in developing countries, or, at least, a balance is needed with more publications originating from developing economies. Accordingly, Ofori [87] called for more research rooted in context of developing economies, which largely have an informal industry structure, low technology penetration, and lack of managerial skills. With this in mind, the primary objective of this study was twofold. First, the study aimed at exploring the sustainable project management practices of large construction firms in developing countries, with a specific focus on Pakistan. Secondly, this study attempted to validate SPM as a second-order construct in context of the Pakistani construction industry, using partial least square structure equation modeling, with support from the triple bottom line approach. The results revealed that large Pakistani construction firms observe the sustainability practices with varying degrees of attention being paid to different SPM aspects. The findings also demonstrate that environmental sustainability is considered more important when compared to other components of SPM, with social sustainability receiving the least attention (as shown by second-order loading values). Moreover, the confirmation of a measurement model for SPM, with some adjustments, reveals that using SPM as second reflective-reflective order would help in developing parsimonious models to conduct more rigorous quantitative studies in the future.

The Pakistani construction industry is in a transition phase towards sustainability where there exist challenges at policy and operational levels. With the onset of the China–Pakistan Economic Corridor initiatives, an exponential rise in the medium-to-large size construction projects being constructed across the country has been seen, from the northern mountainous regions to southern coastal areas. Critics say that the economic benefits are overriding factors in these construction projects, with ecological and social concerns being undermined [57]. Therefore, construction activities ought to pursue a balance among economic, social, and environmental performance in implementing construction projects. A well-crafted and inclusive policy system is, therefore, needed for promoting the sustainable management of construction projects that will balance economic, social, and environmental aspects. However, this study revealed that the current policies related to sustainable management of construction projects in Pakistan are more of a perfunctory nature [88], with environmental aspects as overriding factors. The reasons may include the recent legislation that binds construction firms to strictly abide by the rubrics on environmental management provided by the Environmental Protection Agency [89]. However, this does not guarantee the strategic level adoption of sustainable project management practices by construction firms. As the findings also revealed that a need for construction firms to adopt the intrinsically-driven and proactive sustainability strategies rather than reacting to the coercive-externalities. Compared to environmental and economic sustainability, the second-order measurement model results revealed that the dimension of social sustainability comparatively receives lesser consideration in construction projects. In general, the issues of social sustainability have been reported from different business sectors in Pakistan [6]. The study by Khokhar et al. [89], for instance, reported similar difficulties in the supply chain context of Pakistan. On the whole, due to the influx of different stakeholder requirements, social sustainability becomes too difficult to manage, especially in construction projects. Internally, the welfare of employees, increasing work-safety protocols, and good remuneration policies become daunting tasks to manage, in-terms of budget. Thus, construction firms often find it hard to show full and appropriate compliance to social sustainability in construction projects [14,89].

In conclusion, SPM provides a viable solution to leverage the notion of sustainable development if implemented with a holistic approach, i.e., by considering the three sustainability dimensions together, not as a piecemeal. The results of the measurement model show that the environmental dimension of sustainability is the overriding theme in the Pakistani construction industry that firms understand well. In fact, the term sustainability is most often taken as a proxy for managing only environmentally adverse effects of a construction project. However, the emerging theme of SPM in the construction industry needs the three criteria to be considered simultaneously. Implementing SPM practices in isolation with a predominant focus on a subset-dimension could render it unsuccessful in terms of achieving the overall goal of sustainable development. From a methodological standpoint, SPM could be better used as a second-order reflective-reflective construct and researchers may design more parsimonious models by replacing the three individual constructs of economic sustainability, environmental sustainability, and social sustainability with a single, second-order construct of SPM. Moreover, partial least square structure equation modeling is an emerging technique to validate a particular theoretical construct in a particular setting, as long as the objectives of measurement model confirmation are met comprehensively. Yet, researchers need to understand the practical implications of each method for construct validation, and the distinct outcomes, so that they could make informed decisions. Both confirmatory factor analysis and confirmatory composite analysis can be used to improve individual items, as well as the overall scale reliability. However, owing to comparatively better results, researchers favor and emphasize the use of the confirmatory composite analysis.

6. Limitations and Future Recommendations

While this study offers many valuable insights on SPM, the findings may be constrained by some limitations. The first limitation of the study is about the set of sustainability indicators used. This study was conducted using the most appropriate manifest variables from the existing literature. Past research has used a diversified set of indicators, covering various aspects of sustainable development (SPM in our case); therefore, this study by no means, claims to represent an exhaustive list of sustainability indicators to be used in SPM research in the construction industry. The future studies may use these manifest variables, but with due diligence, after following the pre-test procedures that include content validity and face validity checks.

The second limitation of this study comes from the sampling design that includes the large construction firms only. However, results might be improved by including the small construction firms in future studies. Finally, this study did not take into account the geographical presence of the construction firms within Pakistan. There are possibilities that a particular firm may act differently in remote areas and show a responsible approach towards sustainability in main urbanized locations (or vice versa). Future studies may be conducted by forming strata, with respect to geographical presence of the firms. Moreover, the SPM construct validated in this study with data from construction firms may be applied to project-based activities in other industries, such as manufacturing, in developing countries. A comparison of results obtained from cross-industry studies would help in the progression of the novel theme of SPM as a well-established academic domain. From the practitioner's perspective, such research would help in developing a generic framework of guidelines that covers the essentials of sustainability to be implemented in projects. This will subsequently help project managers in making informed decisions, in terms of integrating sustainability criteria in project management.

Author Contributions: Conceptualization and framework: M.U., M.W.A.K.; literature review: M.U., A.H., F.R. and A.K.; methodology and analysis: M.U., M.W.A.K.; discussion and conclusion: M.U., A.H. and F.R.; writing–original draft, M.U., M.W.A.K.; writing—review and editing: M.U. and A.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no internal or external funding from any commercial or non-commercial source.

Acknowledgments: The authors of this study would like to extend a word of thanks to the PEC registered construction firms for participating in the data collection process.

Conflicts of Interest: The authors declare no conflict of interest.

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