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Antecedents and Consequences of Sustainable Project Management: Evidence from the Construction Industry in China

Shih-Wei Wu [1], Yifan Yan [2], Jialiang Pan [3,*] and Kun-Shan Wu [4,*]

[1] Department of Business Management, National Taipei University of Technology, Taipei 10608, Taiwan; swu@mail.ntut.edu.tw
[2] College of Management, National Taipei University of Technology, Taipei 10608, Taiwan; t109749405@ntut.edu.tw
[3] School of Business and Management, Jiaxing Nanhu University, Jiaxing 314001, China
[4] Department of Business Administration, Tamkang University, Taipei 251301, Taiwan
* Correspondence: 220055@jxnhu.edu.cn (J.P.); kunshan@mail.tku.edu.tw (K.-S.W.)

Abstract: SPM (sustainable project management) is vital to enhancing the success of projects. Despite several studies dealing with the connection between SPM and project success, this nexus is still insufficiently addressed. Steered by institutional theory and resource-based value theory, the purpose of this article is to investigate not only the link between SPM and SPS (sustainable project success), but also the mediating effect of SPP (sustainable project planning) on this connection, and the antecedent role of the institutional pressures (mimetic isomorphism pressure, MIP; normative isomorphism pressure, NIP) on SPM. To test the proposed hypotheses, this article applies PLS-SEM (partial least squares structural equation modeling) and recruited 365 project professionals who have experience in participating in SPM projects in China's construction industry. The results confirm that both MIP and NIP significantly affect SPM, with NIP being the most significant. Moreover, the findings evidence that SPM had a significantly positive impact on SPS and SPP, and SPP had a significantly positive effect on SPS. Furthermore, the results also evidence that SPP mediates the effect of SPM on SPS. These findings provide empirical evidence for construction companies to understand SPM in the Chinese construction industry. They may also help policymakers to formulate proper policies to promote SPM to achieve sustainable development.

Keywords: sustainable project management; institutional isomorphism; sustainable project planning; sustainable project success; construction industry

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1. Introduction

In recent times, the topic of sustainability has become increasingly important in construction project management. Sustainability is seen as a crucial factor for project success. Organizations around the world are striving to implement sustainable project management (SPM) not only to achieve organizational or project goals, but also to continue to create value in the marketplace.

SPM and traditional project management (PM) have a variety of natural differences and there are many contrasting characteristics between SPM and traditional PM [1,2], as shown in Figure 1. While the traditional PM method focuses on achieving project results within a specified time, budget, and quality [3], the SPM approach basically focuses on the entire life cycle of project results, as well as the harmonization of TBL (triple bottom line) aspects (economic, environmental, and social) simultaneously when managing projects [4], primarily focusing on the values and interests of the stakeholders [5]. Furthermore, the authors [6] highlighted the need to consider SPM practices, as improving SPM practices should also be viewed as an opportunity for businesses to create economic, environmental, and social benefits. Additionally, they asserted that SPM could bring long-term benefits to firms, such as improved operational efficiency and reputation.

Characteristic	Traditional PM	SPM
Term	Short term oriented	Long term+ short term oriented
Interest Orientation	In the interest sponsors	In paying attention to the present generation and to future generations
Deliverable	Deliverable/result oriented	Life cycle oriented
Concerns	Scope, Time, Budget	People, Planet, Profit
Complexity	Reduced complexity	Increasing complexity

Figure 1. The difference between the concepts of traditional PM and SPM.

However, SPM is resource-intensive, especially when managing large construction projects. The resource intensity of SPM has increased resource constraints. As a result, construction project managers are looking for innovative solutions and sustainable practices to help them maintain a competitive edge in the global construction industry [7]. Because of this increasing competition and changing environment, the ability to successfully integrate SPM into construction projects has remained a significant challenge for global construction companies [8].

However, there is a gap in the literature, especially regarding the factors and mechanisms that enable SPM practices [9]. Recent academic discussions of SPM have referred to project externalities, which include external stakeholders and institutional isomorphic pressures as contributing factors to SPM [10–14]. Examination of this pressure in the context of projects, however, is still lacking [15] and research findings to date have been inconsistent. For example, some studies have found that institutional isomorphic pressures have little or no effect [16], while other studies have emphasized the enabling role of both mimetic isomorphic pressure (MIP) and normative isomorphic pressure (NIP) on SPM in the manufacturing industry [14,17,18]. Thus, this paper aims to fill this research gap. Moreover, this study included MIP and NIP as the antecedent variables that enable SPM in developing countries, such as China.

Sustainability, which integrates environmental, economic, and social factors, has become an essential part of project acceptance and success [19–22]. In addition, most of the previous research on the nexus between SPM and project success (PS) has been conducted in the context of developed countries [23–28] and there have been few empirical articles examining the SPM-PS relationship in developing countries [22,29,30]. Furthermore, most previous studies have focused on assessing the direct relationship between SPM and PS. However, there has been a lack of identification of the key mechanisms through which this association can be strengthened. This research therefore agrees with the suggestion of scholars [31] to include some mediating variables to study the SPM–PS relationship, but the literature is still insufficient on this issue and more research is needed. Consequently, to fill this gap in the literature, this paper incorporated SPP (sustainable project planning), a mediating variable to investigate the SPM–SPS connection by drawing on scholars [30]. Hence, the research questions are: (1) Do institutional pressures (MIP and NIP) enable the implementation of SPM? (2) Does SPM have an impact on SPS in the construction industry? (3) Does SPP mediate the relationship between SPM and SPS?

The construction industry accounts for a large proportion of China's GDP. It is therefore an important part of the domestic economy. In 2022, China's construction industry generated about 8.3 trillion yuan in value added, accounting for 6.9% of China's gross domestic product. Construction value added in China has grown by at least 3.5 percent annually over the past decade, outpacing the average growth rate of China's GDP over the same period [32]. Therefore, this study recruits the project management professionals who participated in SPM projects in the construction industry in Beijing, the capital of China, to find the answers to the above research questions.

The findings of this study contribute to SPM research in four critical ways. Firstly, this paper provided support for MIP and NIP as important enablers of SPM, thus adding to the current body of knowledge. Secondly, this article provides support for the SPM–SPP relationship and SPM–SPS relationship, and SPP mediates the relationship between SPM and SPS. Thirdly, previous studies have used developed country data, and evidence from emerging economies remains scarce. This study bridged the gap through an examination of SPM, SPP, and SPS relationships in China. Lastly, the novelty of this research addresses a significant knowledge gap and provides valuable insights for exploring the antecedent and mediator variables of the SPM–SPS relationship in sustainable construction.

The rest of this article is organized as follows. Firstly, a literature review and hypotheses development are provided and discussed. Secondly, it provides an overview of the data collection method and research process, offers data analysis, and presents the findings of the study. Thirdly, the results of the study are discussed, and the resulting conclusions are drawn. Finally, the limitations and directions for future works are also included.

2. Literature Review and Hypothesis Development

2.1. Sustainable Project Management

Sustainability is an important aspect of modern construction project management. Sustainable project management (SPM) is a new concept that is now being considered by many organizations when managing projects and making business decisions, and has evolved through the implementation of the concept of sustainable development in project management, with the aim of identifying sustainable project objectives and ensuring that they are compatible and aligned with environmental, economic, and social objectives [14].

The concept of SPM has been conceptualized in different ways in the existing literature; however, SPM is generally understood as the application of the economic, environmental, and social aspects of sustainable development to project management [33]. In addition, in the construction industry, some common definitions of SPM have been concerned with reducing resource utilization [34], accounting for significant project externalities [35], and protecting human and ecological resources [36]. In agreement with [30], this paper focuses on evaluating SPM through the economic, environmental, and social benefits of construction firms. To enable SPM, it is essential to support biodiversity and reduce the utilization of natural resources, liquid waste, and energy.

2.2. Mimetic and Normative Isomorphic Pressure

Institutional theory [37] emphasizes that organizational decisions should depend on the institutional environment and organizations should change their behavior to ensure legitimacy in accordance with their institutional environment. In general, there are three types of institutional pressures on organizations, namely coercive, mimetic, and normative isomorphism [38].

Coercive isomorphic pressures are said to come from structured government laws and clear regulations such as policies, evaluation criteria, and general codes of conduct, [39] and from other stakeholders (e.g., key customers, suppliers, other stakeholders) [18]. A study by scholars [40] questioned the importance of mandatory isomorphism (e.g., government regulations) for managing environmental sustainability in construction projects. Similarly, Willar et al. [41] highlighted the gap between the implementation of sustainability standards and government regulations in construction projects. As the significance of coercive isomorphic pressure for SPM in the project context remains questionable, the question of its relevance to SPM is not discussed in this study.

Mimetic isomorphism is the replication or imitation of actions when an organization does not follow a given course of action in a specific situation [42]. In the case of ambiguity and uncertainty in organizational decision-making, mimetic isomorphism may be viewed as a viable solution. Mimetic isomorphism pressure (MIP) puts pressure on organizations to follow the approach of leading organizations that have been successful.

Normative isomorphism includes professional norms and codes of conduct developed through professional networks, formal education and training, and employee mobility between firms. Normative isomorphism pressure (NIP) is created by professional associations, professional networks, and industry associations [18].

Two studies [14,17] highlighted the role of MIP and NIP in enabling SPM in manufacturing. These studies, however, were based on literature reviews and failed to provide empirical validation using sufficient data and reliable techniques. Recently, Ullah et al. [18] used institutional theory to analyze the impact of MIP and NIP on SPM for the construction industry in Pakistan. Their results showed that both MIP and NIP had a significant and positive effect on SPM, with MIP being more influential than NIP. On the basis of the existing empirical studies referred to above, the following hypotheses have been developed:

H1: *MIP has a positive effect on construction SPM.*

H2: *NIP has a positive effect on construction SPM.*

2.3. Sustainable Project Success

The key elements that measure SPS are stakeholders, teamwork, and project efficiency, as well as business preparation for success [30]. In recent years, interest in project management sustainability has grown, with a focus on long-term success [43]. In the last few years, there has been a gradual shift in the construction industry away from traditional development towards sustainable construction. Sustainability in construction projects ensures a balance between economic, environmental, and social factors [44,45]. In line with [30], this study focuses on evaluating SPS through the six dimensions of project efficiency, stakeholders, team, business success, preparation for the future, and sustainability in the construction industry. The present study explored the sustainable measurement dimensions to predict SPS and SPM in the construction industry.

Martens and Carvalho [31] explored the nexus between SPM and project success through a survey-based study and concluded that SPM had a positive effect on project success. Carvalho and Rabechini [23] verified that project success is affected by the positive impact of SPM. Zaman et al. [29] explored the nexus between SPM and construction project success in Pakistan and found that SPM positively affects construction project success. Scholars [30] investigated the impact of SPM on the SPP and SPS in the Malaysian manufacturing industry. Their findings displayed that SPM positively affects both SPP and SPS. Shaukat et al. [22] investigated the nexus between SPM and project success in three sectors (construction, information technology, and telecommunications) in Pakistan. Their results revealed that SPM positively affects project success. Additionally, Watfa et al. [28] assessed the effect of SPM on the project success of the construction industry in the United Arab Emirates (UAE) using structural equation modeling. They found a significant positive correlation between project success and SPM. According to these empirical studies, the following hypothesis has been developed:

H3: *SPM has a positive effect on construction SPS.*

2.4. Sustainable Project Planning

Project activities [46], such as schedule, costs, and resources, planned during a business organization's project life cycle are all part of project planning. The main tool of SPM is SPP, which enables project managers to better understand this practice and how it can be applied to civil engineering projects [47]. SPP links project planning activities and sustainability principles to ensure that existing project planning processes, activities, and functions are conducted in a sustainable manner. SPP ensures social, environmental, and profitable project implementation [47]. Like previous scholars [30], this paper evaluated SPP according to risk response, management control, and work consensus in construction firms. The project task, process, and solution, as well as managerial control of potential risks, are crucial to the measurement of SPP.

Martens and Carvalho [31] suggest incorporating sustainability principles with TBL dimensions (economic, environmental, and social) into the project management process, which will lead to the integration of SPP and contribute to a commercially successful organization. The primary focus of their study was the company's financial performance and the strengths it derived from stakeholder and cost management, social and environmental practices, and business ethics in economic performance. The findings of [30] exposed that SPM positively affects SPP in the Malaysian manufacturing industry. On the other hand, Urbański et al. [48] explored the moderating role of risk management in SPP and SPS in the construction industry in the UK and Pakistan and found that SPP positively affects SPS. The study of [30] also documented a positive SPP–SPS relationship. According to these empirical studies, the following hypotheses have been developed:

H4: *SPM has a positive effect on construction SPP.*

H5: *SPP has a positive effect on construction SPS.*

2.5. Mediating Effect of SPP

Scholars [31] suggested incorporating sustainability principles with TBL dimensions into the process of project management, which will lead to the integration of SPP and contribute to commercially successful organizations. Chow et al. [30] found SPP as an essential factor in SPS promotion, and the practice of good SPP in the context of SPM can lead the industry to achieve SPS. They also proved that SPP had a mediating effect of SPM on SPS. According to these empirical studies, the following hypothesis has been developed:

H6: *SPP has a mediating effect of SPM on construction SPS.*

Based on reviewing the literature, this article investigated the relationship among the associations among institutional pressures (MIP and NIP), SPM, SPP, and SPS in the construction industry. The present study used the TBL perspective to evaluate sustainability. This article considered how MIP and NIP enable SPM (i.e., economic, social, and environment) and evaluated how SPM reflects SPP (i.e., managerial control, risk response, and work consensus). SPS efficiency (i.e., team business success, preparation for the future, and sustainability) and SPP mediate the effect of SPM on SPS. Figure 2 illustrates the conceptual framework proposed in this study.

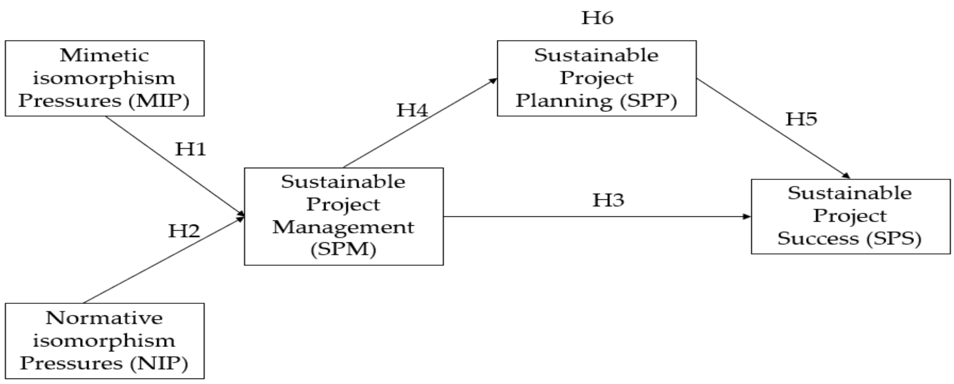

Figure 2. Conceptual model and hypotheses.

3. Research Methodology

3.1. Data Collection and Sample Characteristics

To examine the effect of SPM on SPS in the construction industry, the present paper used a quantitative approach. This study included the mediating effect of SPP between SPM and SPS as well as the antecedent effects of MIP and NIP on SPM. On the basis of structured self-administered questionnaires, the conceptual model was evaluated, and the proposed hypotheses were assessed.

Given the subject of the construction industry, this study targets experienced project management professionals working in large construction firms in China. Since there was no sampling frame, this paper used a non-probability purposive sampling method to select the sample. To draw a representative sample, Beijing City in China was chosen as the sampling location for this study because it is the capital of China and has more and larger construction firms.

The present article collected the data used via face-to-face surveys conducted by skilled interviewers with paper forms. The first section of the questionnaire outlines the study's objectives, confirms participation is optional and anonymous, and verifies that participants' personal data will remain confidential. The following section includes the measurement items that hold questions relating to the research model.

Three hundred and sixty-five project professionals who have experience in participating in SPM projects in large construction firms in China were used in this study. Project professionals were courteously asked if they would be willing to be interviewed and if so, they were invited to take part in the survey. Ultimately, 365 project professionals made up the final sample, and their demographics are detailed in Table 1.

Table 1. Profile of respondents.

Variables	Characteristics	Frequency	Percentage (%)
Gender	Male	205	56.2
	Female	160	43.8
Age	30 or below	135	37.0
	31–40	83	22.7
	41–50	65	17.8
	51 or above	82	22.5
Education	Secondary Vocational School	72	19.7
	Three-year college	76	20.8
	Bachelor	105	28.8
	Graduate and above	112	30.7
Position	Senior Engineer	51	14.0
	Associate Senior Engineer	51	14.0
	Intermediate Engineer	68	18.6
	Assistant Engineer	64	17.5
	Project Manager	131	35.9

3.2. Sample Size

Partial least squares structural equation modeling (PLS-SEM) can deal efficiently with small sample sizes and complex models and makes few assumptions about the underlying data (distribution). In PLS-SEM, the rough guideline is that the sample size should be 10 times the number of arrows pointing to the construct [49]. Furthermore, prior to conducting PLS-SEM, this research employed G*POWER version 3.1.9.7 to check whether the sample size (365) had good enough statistical power to meet the recommendations of Faul et al. [50]. For a two-tailed test with a probability of error of 0.05 and the effect size (0.15), the power (1-β probability of error) was 0.824, well above the recommended cut-off of 0.80.

3.3. Questionnaire Development

The measurement items, SPM, SPP, and SPS, were adopted directly from the study by Chow et al. [30]. MIP and NIP were sourced from Ullah et al. [18]. The wording for each item was amended slightly to ensure it was in context for the survey. For all constructs, the research instrument included only one five-point Likert scale question.

4. Data Analysis and Results

4.1. Measurement Model

4.1.1. Reliability of the Measurement Model

To evaluate the measurement model for reliability and validity, this paper used Smart PLS 4.0 software. Cronbach's α and composite reliability (CR) were used to measure the reliability. In Table 2, all values of Cronbach's α and CR values were above the threshold values of 0.7, the data collected are confirmed to have better reliability [51].

Table 2. Reliability and convergent validity.

1st Order	2nd Order	Items	Loadings	VIF	Cronbach's α	CR	AVE
Institutional pressures	Mimetic Isomorphism Pressures (MIP)	MIP1	0.823	1.808	0.843	0.894	0.679
		MIP2	0.834	1.895			
		MIP3	0.839	1.952			
		MIP5	0.801	1.768			
	Normative Isomorphism Pressures (NIP)	NIP1	0.845	2.032	0.867	0.909	0.715
		NIP2	0.852	2.134			
		NIP3	0.850	2.155			
		NIP4	0.836	1.963			
Sustainable Project Management (SPM)	Economics (ECO)	ECO1	0.897	2.215	0.832	0.899	0.749
		ECO2	0.849	1.868			
		ECO3	0.849	1.826			
	Environmental (ENV)	ENV1	0.861	1.867	0.824	0.895	0.739
		ENV2	0.858	1.847			
		ENV3	0.860	1.854			
	Social (SOC)	SOC1	0.854	1.781	0.82	0.893	0.735
		SOC2	0.860	1.901			
		SOC3	0.858	1.817			
Sustainable project planning (SPP)	Managerial Control (MC)	MC1	0.852	1.795	0.819	0.893	0.735
		MC2	0.875	1.968			
		MC3	0.844	1.763			
	Risk Response (RR)	RR1	0.840	1.682	0.795	0.88	0.71
		RR2	0.869	1.864			
		RR3	0.818	1.596			
	Work Consensus (WC)	WC1	0.848	1.986	0.848	0.897	0.686
		WC2	0.805	1.779			
		WC3	0.841	1.996			
		WC4	0.819	1.824			
Sustainable project success (SPS)	Business Success (BS)	BS1	0.848	1.743	0.803	0.884	0.717
		BS2	0.863	1.833			
		BS3	0.830	1.643			
	Impact on Team (IMT)	IMT1	0.854	1.781	0.801	0.883	0.716
		IMT2	0.843	1.67			
		IMT3	0.841	1.72			
	Impact on Stakeholder—External (ISE)	ISE1	0.861	1.884	0.819	0.892	0.734
		ISE2	0.863	1.846			
		ISE3	0.846	1.757			
	Project Efficiency (PE)	PE1	0.860	1.816	0.792	0.878	0.707
		PE2	0.846	1.731			
		PE3	0.815	1.545			
	Preparation for the Future (PPF)	PPF1	0.858	1.799	0.814	0.889	0.728
		PPF2	0.843	1.74			
		PPF3	0.859	1.838			
	Sustainability (SUS)	SUS1	0.864	1.899	0.825	0.896	0.741
		SUS2	0.868	1.923			
		SUS3	0.851	1.792			

Note: VIF = variation of inflation; CR = composite reliability; AVE = average variance extracted.

4.1.2. Validity of the Measurement Model

The present study applied two methods for the formative and reflective constructs of convergent validity (CV). This research used two criteria to assess the convergent validity of the reflective constructs: factor loading (FL) and average variance extracted (AVE) [51]. Other than MIP4, FLs were larger than the threshold values of 0.7, as shown in Table 2 [52]. In addition, AVE for each construct ranged between 0.679 and 0.749 and exceeded the smallest threshold of 0.50 [53]. Both criteria indicate that the measurement model has a good CV.

This paper assessed the convergent validity of the formulated constructs using outer weights of their relative contribution to the second-order constructs, following the suggestion of Wang and Haggerty [54]. To develop a second-order formative model, the present study used the repeated indicators approach in PLS. Table 3 revealed that the weights were significant for all first-order constructs, supporting the second-order construct of SPM, SPP, and SPS.

Table 3. Second-order construct index weights.

High-Order Constructs	Formative Indicators	Outer Weights	*t*-Values
SPM	Economics (ECO)	0.368 ***	48.078
	Environmental (ENV)	0.363 ***	45.466
	Social (SOC)	0.358 ***	48.511
SPP	Managerial Control (MC)	0.368 ***	45.51
	Risk Response (RR)	0.355 ***	46.701
	Work Consensus (WC)	0.361 ***	46.634
SPS	Business Success (BS)	0.184 ***	49.316
	Impact on Team (IMT)	0.183 ***	46.413
	Impact on Stakeholder—External (ISE)	0.186 ***	43.044
	Project Efficiency (PE)	0.177 ***	41.387
	Preparation for the Future (PPF)	0.183 ***	40.939
	Sustainability (SUS)	0.188 ***	44.236

Note: *** $p < 0.001$.

Next, a correlation analysis was conducted to assess the significant association between the variables of the study. As shown in Table 4, the correlations among the measurement items are positive and significant. Furthermore, discriminant validity was assessed through the Fornell–Larker criterion and the cross-loadings. It can be seen from Table 4 that the square root of the AVE of a facet is larger than the correlation coefficient between this facet and other sides [53]. In addition, the results also showed that in each sample, the factor loadings of the items on their underlying constructs were greater than their cross-loadings on the other constructs (Table 5), thus establishing discriminant validity.

Table 4. Discriminant validity.

	MIP	NIP	ECO	ENV	SOC	MC	RR	WC	BS	IMT	ISE	PE	PPF	SUS
MIP	**0.824**													
NIP	0.823	**0.846**												
ECO	0.753	0.767	**0.865**											
ENV	0.742	0.738	0.771	**0.86**										
SOC	0.742	0.768	0.762	0.763	**0.857**									
MC	0.771	0.787	0.765	0.765	0.755	**0.857**								
RR	0.769	0.762	0.722	0.728	0.771	0.787	**0.842**							
WC	0.782	0.805	0.798	0.787	0.777	0.790	0.801	**0.828**						
BS	0.786	0.815	0.773	0.741	0.752	0.777	0.775	0.797	**0.847**					
IMT	0.790	0.816	0.776	0.733	0.770	0.774	0.766	0.787	0.810	**0.846**				
ISE	0.782	0.798	0.763	0.756	0.795	0.762	0.779	0.808	0.802	0.798	**0.857**			
PE	0.792	0.815	0.768	0.759	0.761	0.766	0.780	0.796	0.787	0.814	0.788	**0.841**		
PPF	0.788	0.804	0.720	0.715	0.763	0.760	0.742	0.761	0.788	0.799	0.765	0.765	**0.853**	
SUS	0.795	0.821	0.743	0.718	0.739	0.753	0.727	0.778	0.812	0.784	0.787	0.758	0.803	**0.861**
Mean	3.768	3.789	3.816	3.797	3.829	3.781	3.732	3.790	3.789	3.832	3.771	3.830	3.862	3.781
Standard deviation	0.912	0.926	0.991	0.973	0.961	0.937	0.940	0.919	0.947	0.889	0.943	0.925	0.924	0.965
Skewness	−1.041	−1.079	−1.216	−1.115	−1.126	−0.999	−1.032	−1.145	−1.012	−1.138	−1.118	−1.092	−1.101	−1.074
Kurtosis	0.516	0.524	0.675	0.590	0.591	0.400	0.472	0.658	0.293	0.856	0.619	0.536	0.725	0.508

Note: The main diagonal displays the square root of the AVE value, which are highlighted in bold.

Table 5. Cross-loadings.

	MIP	NIP	ECO	ENV	SOC	MC	RR	WC	BS	IMT	ISE	SPE	PPF	SUS
MIP1	0.823	0.696	0.659	0.624	0.616	0.639	0.656	0.661	0.675	0.681	0.663	0.642	0.66	0.695
MIP2	0.834	0.705	0.628	0.619	0.647	0.66	0.624	0.657	0.677	0.688	0.652	0.694	0.699	0.69
MIP3	0.839	0.684	0.623	0.636	0.618	0.655	0.631	0.672	0.652	0.643	0.66	0.646	0.653	0.655
MIP5	0.801	0.628	0.568	0.566	0.561	0.584	0.625	0.584	0.583	0.587	0.602	0.627	0.578	0.575
NIP1	0.698	0.845	0.677	0.652	0.631	0.684	0.63	0.707	0.66	0.682	0.664	0.708	0.678	0.669
NIP2	0.718	0.852	0.63	0.639	0.661	0.656	0.664	0.692	0.719	0.693	0.708	0.692	0.685	0.687
NIP3	0.686	0.85	0.63	0.586	0.642	0.647	0.63	0.664	0.703	0.682	0.678	0.664	0.674	0.709
NIP4	0.684	0.836	0.656	0.616	0.664	0.674	0.651	0.657	0.677	0.703	0.651	0.692	0.682	0.711
ECO1	0.687	0.715	0.894	0.69	0.693	0.703	0.662	0.725	0.722	0.707	0.701	0.708	0.656	0.691
ECO2	0.629	0.643	0.855	0.687	0.633	0.649	0.605	0.654	0.648	0.637	0.617	0.632	0.59	0.615
ECO3	0.637	0.632	0.847	0.623	0.65	0.631	0.607	0.693	0.635	0.67	0.663	0.653	0.623	0.622
ENV1	0.608	0.612	0.677	0.862	0.651	0.664	0.641	0.687	0.666	0.602	0.637	0.661	0.604	0.623
ENV2	0.662	0.635	0.666	0.858	0.641	0.653	0.619	0.661	0.62	0.636	0.658	0.66	0.599	0.615
ENV3	0.645	0.657	0.646	0.86	0.678	0.657	0.617	0.683	0.625	0.652	0.654	0.638	0.642	0.614
SOC1	0.642	0.66	0.706	0.681	0.857	0.663	0.67	0.693	0.658	0.674	0.704	0.672	0.642	0.639
SOC2	0.615	0.645	0.631	0.623	0.862	0.62	0.667	0.638	0.621	0.613	0.644	0.625	0.649	0.605
SOC3	0.651	0.671	0.618	0.657	0.853	0.658	0.645	0.665	0.655	0.694	0.694	0.659	0.672	0.657
MC1	0.651	0.648	0.644	0.663	0.674	0.853	0.688	0.678	0.674	0.664	0.652	0.64	0.647	0.64
MC2	0.691	0.693	0.691	0.67	0.675	0.874	0.687	0.694	0.679	0.675	0.678	0.689	0.663	0.658
MC3	0.64	0.685	0.631	0.634	0.591	0.844	0.648	0.659	0.645	0.653	0.629	0.64	0.644	0.639
RR1	0.637	0.641	0.61	0.61	0.635	0.705	0.839	0.651	0.669	0.646	0.65	0.685	0.649	0.593
RR2	0.706	0.672	0.623	0.627	0.697	0.69	0.87	0.706	0.683	0.663	0.702	0.658	0.615	0.657
RR3	0.597	0.611	0.592	0.602	0.614	0.589	0.817	0.666	0.606	0.628	0.615	0.628	0.611	0.586
WC1	0.681	0.715	0.705	0.691	0.66	0.692	0.678	0.843	0.722	0.699	0.729	0.718	0.652	0.683
WC2	0.617	0.636	0.638	0.6	0.616	0.592	0.621	0.807	0.608	0.622	0.618	0.613	0.587	0.61
WC3	0.644	0.677	0.664	0.676	0.643	0.671	0.679	0.843	0.655	0.631	0.656	0.66	0.65	0.647
WC4	0.649	0.636	0.637	0.638	0.653	0.659	0.673	0.821	0.655	0.656	0.672	0.644	0.633	0.634
BS1	0.679	0.702	0.628	0.63	0.642	0.67	0.681	0.678	0.848	0.697	0.687	0.7	0.663	0.665
BS2	0.651	0.69	0.681	0.644	0.654	0.66	0.664	0.694	0.861	0.704	0.675	0.665	0.677	0.699
BS3	0.669	0.679	0.656	0.609	0.615	0.644	0.624	0.654	0.831	0.657	0.677	0.634	0.663	0.699
IMT1	0.667	0.71	0.662	0.613	0.673	0.661	0.627	0.662	0.679	0.854	0.677	0.709	0.675	0.659
IMT2	0.691	0.691	0.664	0.646	0.646	0.675	0.687	0.69	0.709	0.842	0.704	0.694	0.699	0.651
IMT3	0.646	0.669	0.643	0.6	0.636	0.629	0.63	0.645	0.668	0.842	0.645	0.663	0.653	0.679
ISE1	0.669	0.685	0.65	0.619	0.672	0.632	0.655	0.691	0.691	0.689	0.863	0.651	0.643	0.677
ISE2	0.695	0.705	0.69	0.669	0.705	0.671	0.694	0.692	0.731	0.708	0.864	0.711	0.662	0.687
ISE3	0.646	0.662	0.621	0.654	0.666	0.654	0.653	0.694	0.638	0.653	0.844	0.661	0.662	0.659
PE1	0.673	0.691	0.677	0.644	0.628	0.643	0.663	0.682	0.66	0.701	0.669	0.858	0.633	0.627
PE2	0.683	0.694	0.629	0.641	0.642	0.647	0.681	0.668	0.664	0.677	0.639	0.845	0.662	0.643
PE3	0.64	0.67	0.63	0.629	0.65	0.641	0.623	0.657	0.66	0.675	0.678	0.818	0.633	0.64
PPF1	0.676	0.681	0.637	0.634	0.677	0.67	0.64	0.652	0.691	0.667	0.676	0.648	0.855	0.678
PPF2	0.66	0.68	0.587	0.604	0.629	0.635	0.631	0.635	0.655	0.704	0.646	0.658	0.847	0.689
PPF3	0.68	0.698	0.62	0.593	0.648	0.64	0.628	0.663	0.673	0.674	0.636	0.652	0.858	0.689
SUS1	0.711	0.721	0.637	0.607	0.619	0.657	0.623	0.679	0.705	0.668	0.682	0.655	0.689	0.864
SUS2	0.672	0.722	0.64	0.631	0.638	0.673	0.633	0.666	0.703	0.705	0.701	0.659	0.707	0.869
SUS3	0.671	0.676	0.643	0.616	0.653	0.615	0.622	0.663	0.688	0.65	0.649	0.642	0.677	0.849

4.1.3. Common Method Bias (CMB) and Multicollinearity

The paper uses the variance inflation factors (VIFs) to assess multicollinearity, which were obtained using the PLS algorithm. The range of VIF values was 1.545–2.215 for the first-order variables and was lower than 5 [55]. VIF values ranged from 1.545 to 2.611 for the second-order variables and was lower than 5 [55]. This paper did not find a significant multicollinearity problem with these results.

Table 4 shows the construct correlation matrix. All inter-construct correlations were below 0.823. Common method bias (CMB) is usually supported by correlations greater than 0.90 [56]. For each of the constructs, this paper also measured the full collinearity VIFs, which revealed both vertical and lateral collinearity [57]. VIF should be less than 3.3 to exclude CMB [58] and, according to the study results, the VIF values were less than 3.3 for each of the first- and second-order variables. Consequently, it can be considered that the problem of CMB for this study was not serious.

Furthermore, several procedural measures were taken to restrain CMB, such as using simple language, ensuring the highest level of participant confidentiality and anonymity, informing them that there were no right or wrong answers, and listing the exogenous construct items before the endogenous construct items during the development and administration of the questionnaire [59,60].

4.2. Structural Model

Before evaluating the hypotheses, the researchers also tested for normal distribution conditions such as homoscedasticity, autocorrelation, and normality. Homoscedasticity was assessed using Levene's test, and the results of Levene's test (F = 1.230, $p = 0.191 > 0.05$) were not significant, indicating homogeneity of variance among the independent variables. Autocorrelation was examined using the Durbin–Watson (DW) statistic (e.g., DW = 1.861, which ranges from 1.5 to 2.5), indicating that no autocorrelation was found in the data set. Normality was assessed using skewness and kurtosis. All values for skewness and kurtosis confirmed the normality of the data (see Table 4) [61].

The hypotheses were tested using a bias-corrected and accelerated bootstrap procedure with 5000 subsamples, as proposed by Hair et al. [51]. The empirical results and hypothesis tests of the structural model are shown in Table 6. Figure 3 shows the path graph for these construct relationships. More accurate and precise constructs are supported by higher R^2 values: SPM explained 73.6% of the variance, SPP explained 80.5% of the variance, and SPS explained 87.2% of the variance.

Table 6. Structural model examination outcome.

		Beta	*t*-Values	95% LLCI	95% ULCI	Remarks
H1	MIP → SPM	0.411	8.588	0.333	0.492	Supported
H2	NIP → SPM	0.486	10.24	0.405	0.563	Supported
H3	SPM → SPS	0.411	5.245	0.294	0.556	Supported
H4	SPM → SPP	0.897	62.999	0.871	0.918	Supported
H5	SPP → SPS	0.547	6.932	0.398	0.662	Supported
H6	SPM → SPP → SPS	0.491	6.722	0.355	0.597	Supported

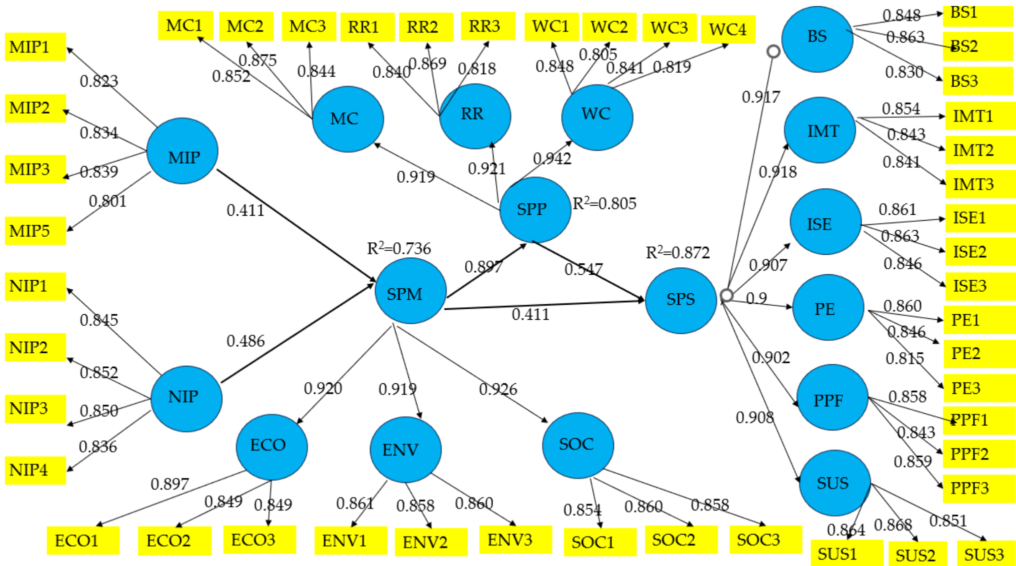

Figure 3. Structural model after testing and adjustments.

Table 6 shows that PMP significantly affects SPM (β = 0.411, t = 8.588 and p < 0.01); PNP significantly affects SPM (β = 0.486, t = 10.24 and p < 0.01); and SPM significantly affects SPS (β = 0.411, t = 5.245 and p < 0.01). Hence, this paper found that the first three hypotheses, H1, H2, and H3, were supported. Additionally, the nexus between SPM and SPP was positive and significant (β = 0.897, t = 62.999 and p < 0.01), and SPP positively affects SPS (β = 0.547, t = 6.932 and p < 0.01). Accordingly, this article also found that H4 and H5 were supported (Table 6).

Furthermore, the present study used the cross-validated redundancy index Q^2 to assess the predictive relevance (PR) of the proposed model. The findings show the PR of the model, as the Q^2 value is above zero [62]. To assess the substantive effect of an omitted construct on the endogenous constructs, this paper used the effect size f^2 and found the f^2 values for SPM, SPP, and SPS to be 0.246, 0.257, and 0.456, respectively, which exceeded the criteria of 0.150 and 0.350 [63].

To confirm that the proposed model sufficiently explained the empirical data, this research used the goodness-of-fit index (GOF). The GOF value was 0.437, which showed that the model verified the criterion of 0.3 [64]. According to Henseler et al. [65], the ability to assess the indirect and direct relationships between endogenous and exogenous latent variables is essential to evaluate a structural model. The present study found that SPP mediates the effect of SPM on SPS (β = 0.491, t = 6.722 and p < 0.01).

5. Discussions

This study examined the effect of SPM on constructions' PS with the antecedent role of the institutional pressures (MIP and NIP) and mediating role of SPP in a developing country, China. The results extend SPM research and contribute to the existing empirical findings.

Firstly, the results positively answer research question 1—Do institutional pressures (MIP and NIP) enable the implementation of SPM? Based on the institutional theory, the findings support the underlying hypothesis that institutional isomorphism is a crucial factor in SPM in developing countries [18]. In addition, the results find that both MIP and NIP significantly affect SPM. These findings are consistent with the contentions of [14,17,18]. Furthermore, NIP asserted a greater influence than MIP to predict the implementation of SPM on construction projects. These results suggested that construction firms improved their implementation of SPM under NIP from professional networks and associations as well as industry associations.

Secondly, regarding to the second research question, SPM significantly affects SPS. According to the resource-based view (RBV), SPM is a key determinant of SPS, which showed that SPM enabled construction industries to have a competitive advantage by successfully delivering projects [22,66]. Several studies [22,24,28–30] have confirmed that SPM positively affects SPS.

Thirdly, SPM had a significant influence on SPP. Several studies [25,30,47] have highlighted that construction project management and planning should be integrated. Project planning can guide a project team in executing, controlling, and monitoring projects. SPP can also identify and then reduce project risks and enable communications with team members and stakeholders who have contributed to SPM [24].

Fourthly, the findings showed that SPP significantly affects SPS, which is in sync with other analyses [30,47]. This implies that SPP is an essential tool that affects the construct firm's SPS. To sum up, SPM and SPP can lead to SPS for the construction company. Environmental, economic, and social dimensions are critical to SPM. The results demonstrated that a construction's financial and economic performance, financial benefits, cost management, natural resources, energy, labor practices, and relationships with local communities can enhance SPM [30].

Lastly, about the third research question, SPP mediated the effect of SPM on SPS. This result was in agreement with earlier propositions [30]. SPP is a critical tool for project management to achieve the construction company's project success. In the context of SPM, good project planning enables the construction industry to achieve SPS. It shows that both SPM and SPP lead to better SPS in the construction sector. To support sustainable business development, these results can provide construction industry guidelines and project management direction.

6. Conclusions

According to the above-mentioned findings, the results of this research elicit several crucial implications. Academically, the first contribution of the article is highlighting the role of MIP and NIP in facilitating SPM in China. This research model enriches the current body of literature by examining SPM along with institutional theory and sustainability research. The second contribution is that the results of this study are consistent with the RBV, which suggests the importance of incorporating the implementation of SPM to achieve SPS. The third contribution of the present study is that it has demonstrated that SPP is an important construct that acts as a bridge between SPM and SPS.

The present article also has several practical implications. The first implication is that sustainability practices are strategic issues that should be implemented to respond positively to external pressure. NIP had a more significant impact on project-based construction companies, which revealed that adopting sustainable practices will create a long-term competitive advantage.

The second implication is that SPM is essential to improve construction project success. Environmental, economic, and social dimensions are essential in a construction project's SPM. Therefore, Chinese construction companies need to pay more attention to three dimensions to increase the likelihood of SPS. The importance of the economic factor means that construction firms in China need to adopt strategies that promote cost management techniques and greater stakeholder participation in decision-making. In addition, the consideration of the environmental factors guidelines that ensure the preservation of natural resources and regulating the negative impacts on the environment. Furthermore, social factors also require greater consideration by the construction in managing labor practices and setting up effective associations with customers and local communities.

The third implication is that direction in project management can help the industry achieve SPS. Project managers should improve and evaluate the relationship between SPP and SPM to verify a construction project's SPS. The role of SPP in controlling and guiding project management is critical. The reduction of project risks and the understanding and commitment to the SPS of a construction project should be a priority.

This study has several limitations. First, this research collected data from the construction sector to evaluate the hypothesized model, but the study did not conduct a cross-sector analysis. Future research should address this issue. Second, due to there being no sampling frame, this paper used non-probability purposive sampling. As a result, the sample of this paper was not probability-stratified by country, organization size, or project complexity. To avoid asymmetries between categories, future research should use probability sampling to test hypotheses related to control variables.

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