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Article

Navigating sustainable project management in construction: Exploring the differential impact of coercive pressures and ethical responsibility using importance-performance matrix analysis (IPMA)

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Abstract: This study explores the primary drivers influencing sustainable project management (SPM) practices in the construction industry. This research study seeks to determine whether firms are primarily motivated by external pressures or internal values when embracing SPM practices. In doing so, this study contributes to the ongoing discourse on SPM drivers by considering coercive pressures (CP), ethical responsibility (ER), and green transformational leadership (GTL) as critical enablers facilitating a firm's adoption of SPM practices. Based on data from 196 project management practitioners in Pakistan, structural equation modeling (PLS-SEM) was employed to test the hypothesized relationships. Results highlight that CP influences the management of sustainability practices in construction projects, signifying firms' concern for securing legitimacy from various institutional actors. As an 'intrinsic value', ER emerges as a significant motivator for ecological stewardship, driven by a genuine commitment to promoting sustainable development. This study also unveils the significant moderating effect of GTL on the association among CP, ER, and SPM. Lastly, the results of IMPA reveal that ER slightly performs better than CP as it helps firms internalize the essence of sustainability. This research study expands our understanding of SPM drivers in construction projects by exploring the differential impact of external pressures and the firm's intrinsic values. These findings provide valuable insights for policymakers and practitioners, aiding them in promoting SPM to attain sustainable development goals.

Keywords: sustainable project management; coercive pressures; ethical responsibility; green transformational leadership

1. Introduction

Sustainable practices are paramount in the construction industry due to their considerable impact on environmental degradation. Construction activities remained the primary drivers of carbon emissions throughout the industrial age (Du et al., 2021) and they account for nearly half of the world's energy resources and raw material utilization worldwide. Several construction activities lead to environmental degradation, i.e., land clearing, emissions from engine equipment, demolition, and frequent use of harmful chemicals (Labaran et al., 2022). Hence, adopting more sustainable approaches in managing construction projects becomes imperative, striking a balance between economic prosperity and ecological preservation. Scholars assert that the construction industry, through its promotion of environmental protection, fostering economic growth, and facilitation of social progress, can help

achieve sustainable development goals (Mavi and Standing, 2018). Extant literature shows that identifying influential drivers and critical success factors is essential for promoting SPM practices and achieving sustainable development in the construction industry (Banihashemi et al., 2017). These SPM drivers can significantly enhance the construction system's capability to sustain its economic viability while fulfilling social and environmental responsibilities as well as the requirements of stakeholders.

SPM is a novel research theme that is also emerging as a new school of thought in project management literature. Silvius and Schipper (2014) define SPM as "ensuring profitable, fair, transparent, safe, ethical and environmentally friendly project delivery—aiming at a project deliverable that is socially and environmentally acceptable throughout its lifecycle". According to Sabini et al. (2019), the research on SPM is in the budding phase, where almost 80% of the identified literature has been published in the last few years. A critical review of the recently published literature on SPM shows that most studies on the integration of sustainability criteria in projects are primarily of an interpretive nature (Chang et al., 2015; Sabini et al., 2019; G. Wang et al., 2020; Zuo et al., 2012). These studies include systematic reviews, content analysis, and qualitative case studies (Aarseth et al., 2017; Chawla et al., 2018; Li and Misopoulos, 2020; Ma et al., 2020; Sankaran et al., 2020) where the authors have primarily focused on the integration of sustainability criteria in project management practices. Besides, these studies recognize SPM enablers/drivers as an essential research area that has received little scholarly attention. The existing literature does not provide a comprehensive guideline on the most influential drivers of SPM, particularly in the construction industry context (Banihashemi et al., 2017; Fathalizadeh et al., 2022). Moreover, there exists a noticeable research gap in the literature on the individual effectiveness of the identified drivers in promoting sustainable practices in construction projects. Given the challenges practitioners face in aligning project practices with sustainable development objectives, examining the efficacy of the SPM drivers (He and Chen, 2021) using robust quantitative techniques is necessary. Such empirical investigations will improve our understanding of influential SPM drivers and aid firms in adopting unified and efficient project sustainability strategies. In this backdrop, we specifically explore the role of coercive pressures as a significant external driver of SPM. We posit that embracing sustainability showcases environmental and social commitment to various stakeholders, thereby enhancing legitimacy.

Secondly, we propose that ethical responsibility can be a significant internal SPM driver of firms' intrinsic values. These values lead firms to focus on minimizing their environmental impact- a rationale that has received limited attention in SPM research. In addition, we seek to explore whether external institutional mechanisms influence firms' adoption of SPM practices or they are intrinsically motivated to manage sustainability in construction projects. To the best of our knowledge, there is a noticeable gap in the existing literature regarding this kind of comparative analysis of various SPM drivers. Lastly, we seek to investigate the role of green-oriented leadership in driving sustainability initiatives within construction firms by examining GTL as a moderator. Taking into account the paradoxical nature of SPM practices (Sabini and Alderman, 2021), it is highly needed to explore the subtle mechanisms and subjective social conditions which can help a firm to enhance its sustainability

performance (Priyadarshini et al., 2023). While existing literature underscores the significance of GTL in promoting sustainable firm performance (Zhong et al., 2023), limited scholarly attention has been directed towards understanding the role of GTL as a moderator in implementing SPM practices in construction projects.

In sum, this research adds to the current body of knowledge by integrating insights from institutional theory and green transformational leadership theory, culminating in a conceptual model that no previous study has explored. Furthermore, our study advances the discourse on SPM implementation by employing the robust technique of IPMA to prioritize the influential SPM drivers. The findings offer substantial managerial and theoretical insights valuable for project managers and policymakers alike.

The rest of the research paper is structured as follows: Section 2 explains the relevant literature and outlines the research hypotheses. In Section 3, we discussed the research methodology. Section 4 encompasses the key research findings and their theoretical and practical implications. Lastly, Section 5 encapsulates the conclusions drawn from this study and discusses its limitations.

2. Review of literature

2.1. Sustainable project management

SPM is a relatively novel concept in project management research and is rapidly gaining prominence particularly in construction projects (Stanitsas and Kirytopoulos, 2023). Projects shape the future of corporations, and therefore, the concept of SPM, if implemented properly, can act as a catalyst for achieving broader sustainable development goals (Chofreh et al., 2019). Extant literature reveals that stakeholder pressure is mounting on firms to adopt sustainability practices in their operations, and to behave responsibly while conducting their business affairs (Govindaras et al., 2023). Research shows that integrating sustainability into project processes improves the overall project management value and it also has a significant effect on project success (Blak Bernat et al., 2023). While the definitional framework for ‘sustainable development’ has been set up by the Brundtland Commission report (Brundtland, 1987), SPM is a derivative term that has been conceptualized in diverse ways but broadly defined as the “application of social, environmental, and economic aspects of sustainability to project management” (Cai et al., 2009). The available SPM definitions reinforce that this concept, in essence, refers to the consideration of triple bottom criteria, i.e., “environmental, economic, and social” concerns in managing projects. Thus, SPM requires the project processes to be more sustainable through better utilization of natural resources, minimization of waste, procuring eco-friendly materials, protection of human rights, improving working conditions, and engaging stakeholders. It also requires the project actors to ensure transparency and accountability regarding the project's overall environmental and social bearings on society (Silvius and Schipper, 2014). It is widely known that activities carried out during the construction projects have negative social and environmental impacts. Yet, on the other hand, implementing sustainability criteria in project processes strains the system boundaries as the triple-bottom-line constraints have a bearing on the specifications and basic requirements of the project’s deliverable output (Ika and Pinto,

2022). Thus, integrating sustainability imposes additional criteria for project quality evaluation, rendering SPM an emerging challenge in project management research and practice (Banihashemi et al., 2017). Nevertheless, to tackle this challenge, researchers have scrutinized the drivers of SPM from diverse perspectives, including internal and external factors (Bamgbade et al., 2019). Regarding external factors, scholars argue that organizations embrace sustainable practices in response to external pressures exerted by many institutional actors, including stakeholders, regulatory bodies, community, industry standards, and customer demands (Ullah et al., 2020). Other studies highlight the indispensable role of internal drivers, such as the firm's capabilities, innovative technologies, nature of leadership, and strategic orientations (Shaukat et al., 2022). The study of Banihashemi et al. (2017) comprehensively explores multiple SPM drivers under the banner of critical success factors that influence the integration of sustainability practices in construction projects. Oke et al. (2019) identify legislation, advocacy, awareness, and client demand as the primary external drivers of managing sustainability in construction projects. Likewise, some other studies have contributed to this discourse from different perspectives, yet the existing literature lacks robust quantitative studies on examining individual impact, of the identified drivers on adoption of SPM by construction firms. In this context, the study at hand explores the role of CP and ER as primary divers of adopting SPM practices in construction projects.

2.2. Coercive pressures

CP can be defined as external constraints or influences exerted on a firm by mechanisms or organizations it relies on for resource acquisition and legitimacy. According to DiMaggio and Powell (1983), CP encompasses a broad spectrum of sanctions imposed by various entities (both formal and informal) as well as by cultural expectations within the operating environment of firms. Such pressures essentially mandate firms to adhere to established behavioral norms. Non-compliance with these coercive pressures may result in penalties, as illustrated by the studies of Darnall et al. (2010) and Henriques and Sadorsky (1996). In the context of sustainability practices, CP manifests itself in various mandates, such as regulations and standard governing areas like pollution control, energy efficiency, and product quality.

Previous research has demonstrated that compliance with CP is a primary driver for adopting sustainable management practices. (Phan and Baird, 2015). A firm's strategic decisions can be coercively influenced by sanctions, potentially jeopardizing its social legitimacy. Empirical research also underscores that firms are embedded within a broader social network and often grapple with aligning their behaviors to meet institutional expectations, thereby securing social legitimacy (DiMaggio and Powell, 1983). These institutional mechanisms generally establish normative expectations and standards that significantly influence a firm's conduct. When firms conform to these expectations, stakeholders endorse their role in the institutional context, bestowing social legitimacy upon them. Social legitimacy is a crucial indicator of a firm's societal acceptance, granting it the essential social license to operate in a given environment (Díez-Martín et al., 2021). As a result, firms facing institutional pressures are motivated to maintain their legitimacy and sustain their reputation through appropriate

actions (Masocha and Fatoki, 2018). With few exceptions, scholars agree that CP is crucial in compelling firms to embrace sustainable practices (Clemens and Douglas, 2006; Latif et al., 2020). CP may emanate from regulatory bodies, competitors, customers, and suppliers and serve as a compelling mechanism for firms to conform to sustainability standards. More specifically, CP catalyzes firms to institute a coherent organizational framework that aligns the green strategic objectives across all functional domains. However, the significance of CP as an influential external driver of SPM remains relatively unexplored. Based on these premises, we formulate the following hypothesis:

Hypothesis 1 (H1): Coercive pressures and sustainable project management have a significant positive relationship.

2.3. Ethical responsibility

Bansal and Roth (2000) define ER as a core internal value reflecting a firm's disposition towards ethical values, norms, and its overall commitment to societal well-being. According to Carroll (1991), the primary responsibilities of firms include maximizing profits, complying with legal requirements, adhering to prevailing moral standards, and engaging in discretionary philanthropic activities. According to Zamagni (2012), a firm's responsibility points to its capacity to manage various situations genuinely and effectively. Firms that exhibit ER demonstrate sensitivity to societal norms, a willingness to promote the common good, and a readiness to bear the ultimate outcomes of their intended corporate actions (Galbreath, 2010). In the context of sustainable development, ER is a motivating force for ecological stewardship that emanates from the genuine desire to save the natural ecology. Past research shows that ER significantly motivates firms to participate in sustainable management practices. Furthermore, ethical motivations are recognized as the driving force behind corporate initiatives to reduce their environmental impact (Khan et al., 2021). Firms guided by ecological responsibility view voluntary environmental engagement as a moral imperative, fostering heightened environmental proactivity. Such firms, characterized by a strong ethical responsibility, perceive sustainable practices as the morally correct course of action (Lu et al., 2021; Stahl et al., 2020) and actively participate in environmental and social sustainability initiatives. Likewise, firms focusing on ER often harness their resources to promote sustainability initiatives, which enable them to attain the desired objectives of preserving the environment and enhancing societal well-being (Afsar and Umrani, 2020). Therefore, we propose the second hypothesis as follows:

H2: Ethical responsibility has a significant positive relationship with sustainable project management

2.4. Moderating role of green transformational leadership

GTL underlines the ability to conceptualize a vision for sustainability, adeptly communicate it to others, and motivate them to collectively work towards achieving sustainability goals (Egri and Herman, 2000). Scholars have taken a keen interest in investigating the role of GTL in delivering green outcomes (Bano et al., 2022; Zhong et al., 2023). These studies primarily feature GTL as an influential derivative of green

leadership that helps to improve firms' green performance (Chen and Chang, 2013). To address the external stakeholder pressures concerning environmental degradation, organizations are encouraged to promote GTL practices as they effectively stimulate environmentally responsible job behaviors among employees (Mittal and Dhar, 2016). Empirical evidence presented by Singh et al. (2020) highlights that GTL can catalyze employees' environmental enthusiasm and significantly enhance firms' capacity to opt for green initiatives. Furthermore, GTL fosters an environment in which employees are motivated to acquire new ecological knowledge and actively participate in activities related to green processes and product innovation (Le and Lei, 2018). This, in return, enables organizations to focus on environmentally friendly products and services, subsequently improving their overall environmental performance. However, the interaction of GTL and SPM has received little scholarly attention and the literature on the role of green leadership abilities of project managers in adopting SPM practices is scarce where the existing studies do not explicitly consider the role of GTL in promoting SPM practices. (Banihashemi et al., 2017; Poon and Silvius, 2019; G. Silvius and Schipper, 2020) Thus, there is a need to study the role of GTL juxtaposed with external and internal drivers of SPM. Hence, we formulate the third & fourth hypothesis as follows:

Hypothesis 3: GTL positively moderates the relationship between coercive pressures and sustainable project management.

Hypothesis 4: GTL positively moderates the relationship between ethical responsibility and sustainable project management.

Figure 1 below depicts the conceptual model of the study.

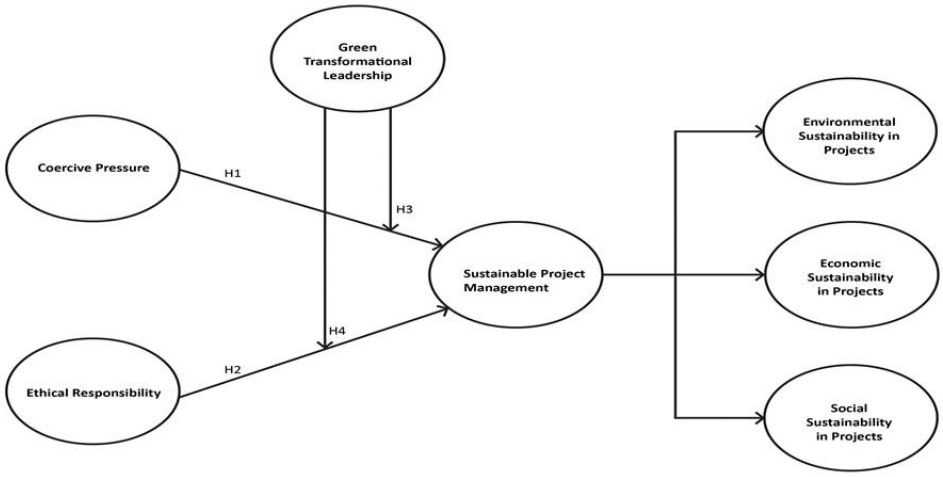

Figure 1. Conceptual model.

3. Research methodology

3.1. Measures

A web-based survey was designed to collect data from project practitioners to meet the study objectives. The questionnaire items for all constructs were adapted/adopted from the existing literature and measured using a 5-point Likert scale. The construct of CP was measured using 04 items which were adapted from the study of Liang et al. (2007). ER was measured using 05 items, adapted from Yue et al. (2023).

To measure GTL, 06 items were adapted from the study of Chen and Chang (2013). SPM was treated as a 2nd order reflective-reflective construct comprised of three 1st order constructs i.e., environmental sustainability in projects (06 items), social sustainability in projects (06 items) and economic sustainability in projects (04 items). SPM was adopted from the study of Ullah et al. (2020).

A panel of five experts conducted a pre-test before finalizing the survey instrument. The team of experts included academicians and project management practitioners. It was ensured that the team members were familiarized with the constructs included in the model, and they could comment on the relevancy of adapted indicators to each construct. The panel of experts evaluated the initial shape of the instrument and indicated the ambiguities in the wording of the adapted questionnaire items. The feedback received from the expert panel was thoughtfully considered and integrated into the final version of the instrument. Before commencing the principal study, a preliminary pilot study involving 30 respondents was executed to ascertain the validity and reliability of the final survey instrument.

3.2. Respondents and data collection

Table 1. Demographic information.

Characteristics	Categories	(N)	(%)
Gender	Male	187	96.9
	Female	9	3.04
Age	< 30	26	-
	30–45	103	42.6
	45–60	67	57.5
Job Title/Designation	Project Manager	82	61.4
	Project Director	56	18.9
	Planning Engineer	16	5.4
	Project Engineer	42	14.1
Education	Bachelors	96	66.2
	Masters	76	25.6
	MS/MPhil	24	8.1
Experience with Current Company	1 to 5 years	72	25.6
	6 to 10 years	57	36.1
	More than 10 Years	67	38.1

G*Power 3.1.9.2 was used to calculate a statistically significant sample size. The power level was set at 90% with a 5% significance level and effect size of 15% (Cohen, 1992). The resultant sample size obtained was 99, representing the required threshold number of responses. Project practitioners working in construction projects across Pakistan were invited to participate in the survey prepared using Google Forms. These individuals were identified through Linkedin which is a famous social media platform for professionals. To identify the most relevant respondents, we applied search filters of ‘construction industry, project management, and Pakistan’, which showed around 2400 project practitioners. Using a convenient sampling approach, we contacted 550

individuals. Data were collected over a period of three weeks which included a reminder after the first week. A total of 196 responses were received making a response rate of 35.6%. The sample demographics are summarized in **Table 1**.

4. Data analysis and results

This study adopted PLS-SEM for data analysis which is considered to be a robust multivariate statistical technique used to analyze relationships among the latent constructs included in a model. It is often performed with software like SmartPLS and is useful for developing and validating theories in exploratory research (Hair et al., 2017). PLS-SEM is particularly useful when the research objectives involve explaining and estimating the target constructs as it offers superior statistical power and efficient parameter estimations, rendering it a preferable choice for complex models (Hair Jr et al., 2021). Since this study aims to explore the causative prediction capabilities of the proposed research model, therefore, PLS-SEM appears to be the most appropriate choice for data analysis (Sarstedt et al., 2016). This study used SmartPLS4 software to apply PLS-SEM and analyze the data by assessing the measurement model in the first step, followed by the structural model. Prior to that, a thorough examination of multi-collinearity was undertaken which involved regressing all the variables included in the model against a single common variable. This step generated corresponding variation inflation factor (VIF) values which were found to be below 3, indicating that single-source data bias did not pose a significant concern in this research.

4.1. Measurement model estimation

The measurement model was assessed following the standard procedures outlined by Hair et al. (2017), which included the evaluation of "indicator reliability, internal consistency reliability, convergent validity, and discriminant validity." The item loadings ranged from 0.623 to 0.907, which were acceptable (threshold 0.5 or 0.430), thus confirming the reliability of individual items. Values of Cronbach alpha and composite reliability for all constructs exceeded the threshold of 0.70, indicating that the internal consistency reliability for each latent construct was established. Convergent validity was confirmed by examining the values of average variance extracted (AVE). The AVE values, ranging from 0.619 to 0.690, provided evidence of satisfactory convergent validity as the recommended range is AVE > 0.50. **Table 2** presents the results of the measurement model. Discriminant validity was examined using the heterotrait-monotrait (HTMT) criterion, as recommended by Henseler et al. (2015). HTMT values below or equal to 0.85 are considered a stricter threshold but values up to 0.90 are also acceptable. **Table 3** shows that all the HTMT values are below 0.85. The measurement model for 2nd order construct of SPM was separately examined by treating the 1st order constructs as loadings of 2nd order and the results are presented in **Table 4**. Hence, it was determined that the participants in the study could effectively differentiate among the four constructs included in the study.

Table 2. Measurement model results.

Sr. No	Constructs	Item Loadings	Cronbach Alpha	CR	AVE
1	Sustainable Project Management (2nd Order)				
	a) Economic Sustainability in Projects				
	ECSP1	0.892	0.895	0.827	0.761
	ECSP2	0.907			
	ECSP3	0.829			
	ECSP4	0.801			
	b) Environmental Sustainability in Projects				
	ESP1	0.832	0.867	0.902	0.606
	ESP2	0.836			
	ESP3	0.846			
	ESP4	0.799			
	ESP5	0.623			
	ESP6	0.730			
	c) Social Sustainability in Projects				
	SOSP1	0.732	0.867	0.902	0.581
	SOSP2	0.735			
	SOSP3	0.757			
	SOSP4	0.816			
	SOSP5	0.722			
	SOSP6	0.774			
2	Ethical Responsibility				
	ER1	0.760	0.811	0.869	0.570
	ER2	0.749			
	ER3	0.810			
	ER4	0.739			
	ER5	0.715			
3	Coercive Pressures				
	CP1	0.761	0.811	0.875	0.637
	CP2	0.806			
	CP3	0.798			
	CP4	0.827			
4	Green Transformational Leadership				
	GTL1	0.817	0.890	0.916	0.647
	GTL2	0.806			
	GTL3	0.818			
	GTL4	0.845			
	GTL5	0.774			
	GTL6	0.762			

Table 3. HTMT results.

	CP	ECSP	ER	ESP	GTL	SSP
CP	-	-	-	-	-	-
ECSP	0.701	-	-	-	-	-
ER	0.890	0.754	-	-	-	-
ESP	0.804	0.738	0.878	-	-	-
GTL	0.832	0.820	0.880	0.823	-	-
SSP	0.847	0.675	0.882	0.861	0.789	-

Table 4. Measurement model for SPM as 2nd order construct.

Construct	Item Loadings	CR	AVE
ESP	0.918	0.91	0.78
ECSP	0.827	-	-
SSP	0.895	-	-

4.2. Structural model-hypothesis testing

The structural model was examined to confirm the hypothesized relationships in the model. Bootstrapping, which is a nonparametric procedure, was used with 5000 resamples to derive the corresponding *t*-values, *p*-values, and path coefficients. As specified in **Table 5** and depicted in **Figure 2**, CP and ER were found to be significant determinants of SPM (CP → SPM: $\beta = 0.335$, t value= 7.072, $p < 0.001$), supporting H1 and H2 (ER → SPM: $\beta = 0.553$, t value= 11.553, $p < 0.001$).

The R^2 value is vital in gauging the predictive accuracy of a model. According to Hair et al. (2017), R^2 values of 0.75, 0.50, and 0.25 represent substantial, moderate, and weak predictive accuracy in the path model. On the other hand, Cohen (1988) introduced slightly more relaxed thresholds for R^2 values, designating 0.26 as substantial, 0.13 as moderate, and 0.02 as weak. In our model, the R^2 value was calculated to be 0.696, which is substantial according to Cohen (1988) but is considered moderate according to Hair et al. (2017). This indicates that the proposed conceptual model possesses a reasonable explanatory significance. The effect size, which essentially reflects the statistical power of a research model, was evaluated using the effect size f^2. Cohen (1988) suggests that values of 0.02, 0.15, and 0.35 represent small, medium, and large effect sizes, respectively. In our case, the f^2 values were determined to be 0.161 and 0.433, signifying the presence of medium and large effect sizes, respectively. Furthermore, predictive relevance, i.e., Q^2 value (Stone–Geisser criterion), was assessed using the PLS-Predict feature available in SmartPLS4. The Q^2 values obtained for this study were 0.555 and 0.310. Any Q^2 value greater than zero (i.e., $Q^2>0$) indicates that the model under exploration possesses adequate predictive relevance.

Table 5. Hypothesis testing results.

	Relationship	β	Std. deviation	t-values	f^2	R^2	Q^2	Decision
H1	CP -> SPM	0.335	0.047	7.072	0.161	0.696	0.691	Supported
H2	ER -> SPM	0.553	0.048	11.553	0.433	-	-	Supported

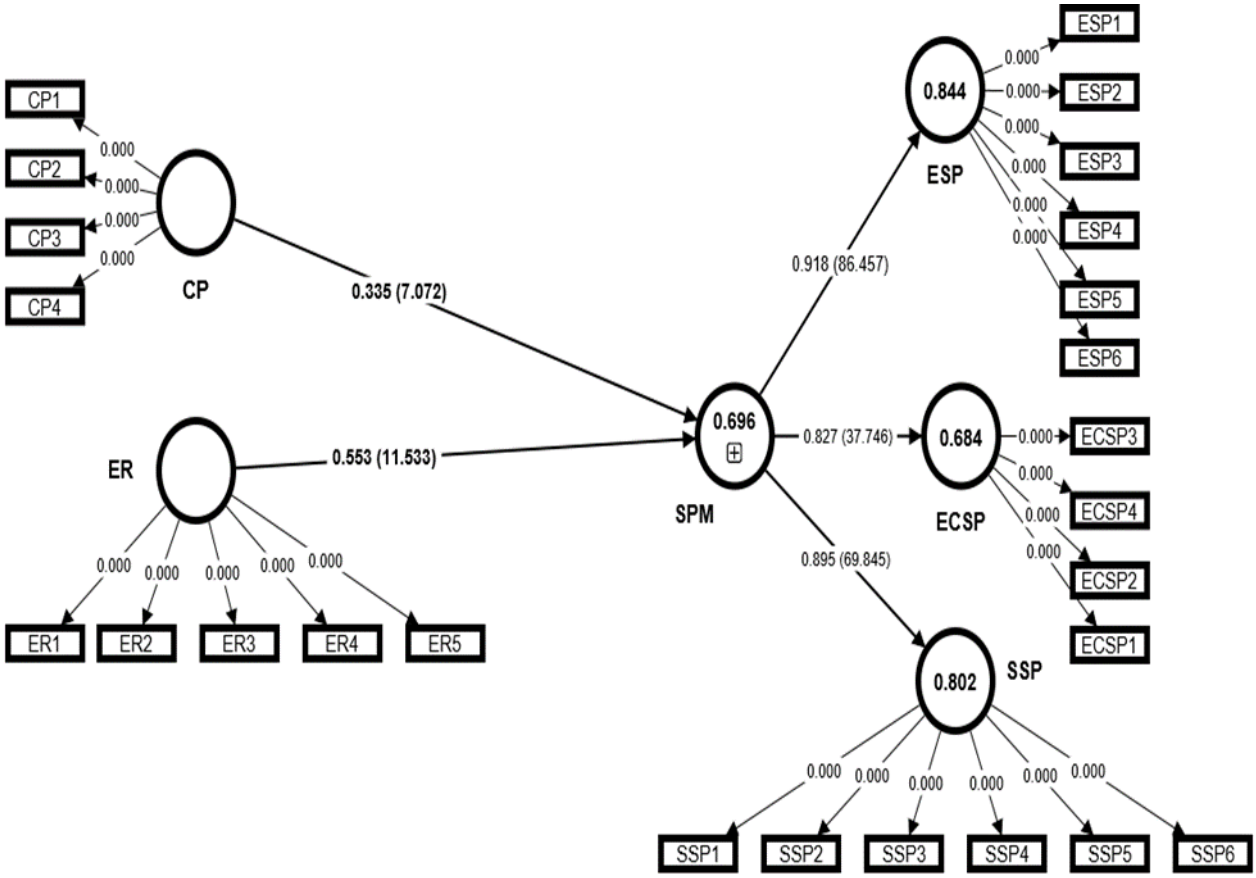

Figure 2. SmartPls output for structural model.

4.3. Moderation analysis

The first step in moderation analysis is to assess the measurement model for the moderating variable, which was carried out using the same standard procedure for all other constructs included in the model. SmartPLS4 carries out the moderation analysis by creating an interaction term. According to Ramayah et al. (2018), researchers only need to consider the interaction term while reporting the results of moderation analysis. The bootstrapping technique was applied to check the *t*- and *p*-value of both the interaction terms, as suggested by Hair et al. (2017). Hypothesis 3 proposed that GTL will positively moderate the relationship between CP and SPM, which turned out to be significant ($\beta = 0.0139$, $t = 4.058$, $p \leq 0.01$). Thus, H3 is supported. Hypothesis 4 proposed that GTL will positively moderate the relationship between ES and SPM, which also turned out to be significant, therefore keeping H4 ($\beta = 0.119$, $t = 3.434$, $p \leq 0.01$). **Figure 3** shows the results of the interaction term for moderating effects.

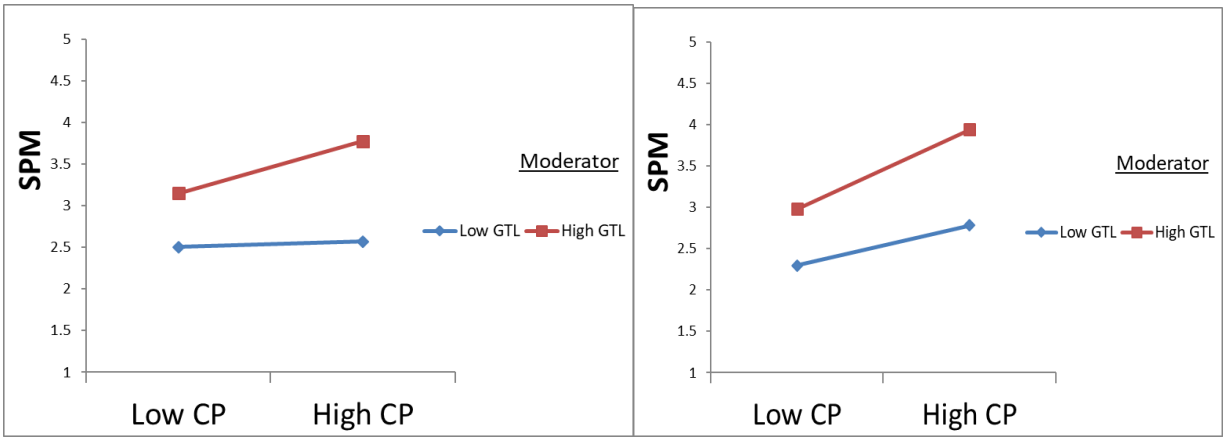

Figure 3. 2-way interaction graph for moderation analysis.

4.4. Importance-performance matrix analysis

IPMA was conducted to confirm the practical significance of the study's findings. According to Ringle and Sarstedt (2016), IPMA reflects the performance level of the latent and the manifest variables in PLS-SEM data analysis. This analysis aims to identify the total effect of the predecessor construct's importance (e.g., CP & ER) in anticipating a target endogenous construct (e.g., SPM). The IPMA technique has two dimensions: importance and performance. The total effect demonstrates the 'importance' of latent variables, whereas the mean value of their scores (ranging from 0 to 100) reflects their 'performance' (Hair et al. 2017). Thus, instead of presenting the importance level of latent and manifest variables using path coefficients only, applying the IPMA technique provides better insight into ranking the most important variables affecting the target construct. Accordingly, IPMA allows prioritizing the variables in order to improve the targeted variable which is quite helpful in identifying the most critical activities that can enhance the dependent variable's performance. In sum, IPMA is advantageous and particularly important in prioritizing managerial actions.

Tables 6 and **7** reflect the values of latent variable indices and the performance of the two constructs. The IPMA results reveal that although ER and CP are almost equal in performance, the former appears to be of greater importance for the targeted construct of SPM. **Figures 4** and **5** show the graphical representation of IPMA.

Table 6. IPMA- construct level.

Constructs	Importance (Total Effect)	Performance (Index Values)
CP	0.335	65.167
ER	0.553	68.803

Table 7. IPMA-indicator level.

Indicators	Importance (Total Effects)	Performance
CP1	0.060	67.314
CP2	0.062	64.949
CP3	0.050	62.669
CP4	0.063	65.794

Table 8. (*Continued*).

Indicators	Importance (Total Effects)	Performance
ER1	0.068	69.003
ER2	0.061	64.780
ER3	0.051	70.693
ER4	0.063	71.875
ER5	0.056	67.230

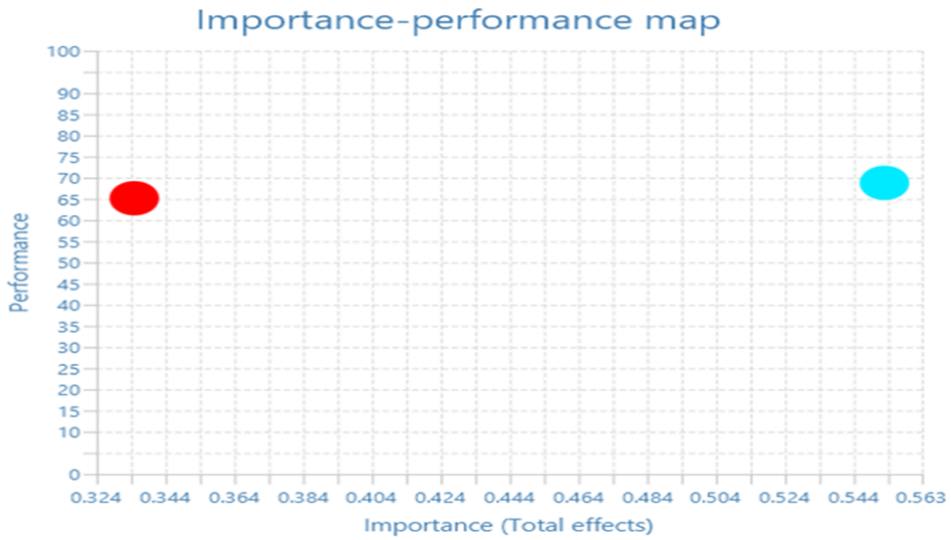

Figure 4. IPMA map-construct level.

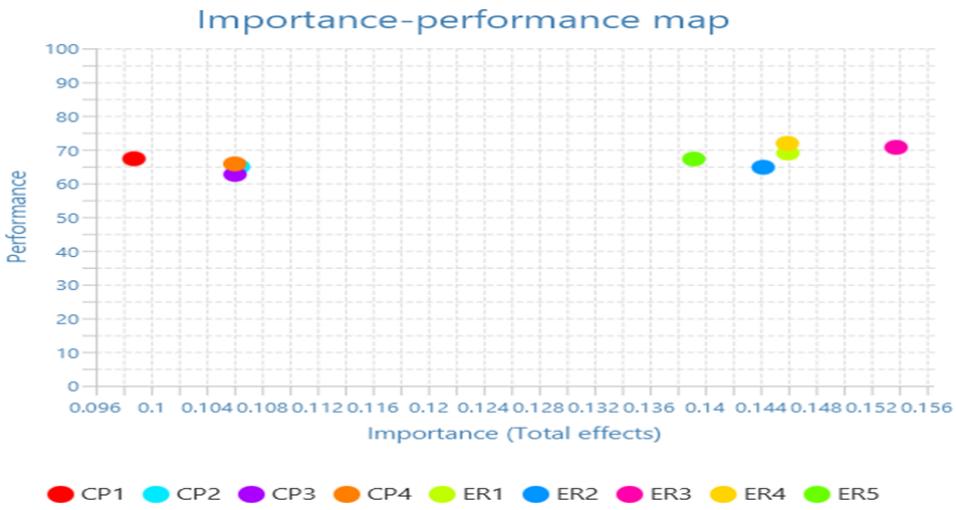

Figure 5. IPMA map- indicator level.

5. Discussion

SPM is an emerging challenging in construction projects, particularly in developing countries like Pakistan. This study intended to measure the factors affecting the firms' adoption of SPM practices in construction projects. We specifically focused on evaluating the impact of CP and ER on the adoption of SPM practices by construction firms while also examining the differential effects of these two factors. The findings of this study provided empirical confirmation of positive and significant

relationships between CP, ER, and SPM. The findings reveal that CP significantly influence the firm's adoption of SPM in the construction industry. The results of PLS-SEM analysis provide strong evidence (CP → SPM: $\beta = 0.335$, t value = 7.072) that construction project managers perceive CP as a critical driver that influence the integration of sustainability criteria in project management. These results support the classic school's position (Wong et al., 1996) and confirm the findings of past studies (Bamgbade et al., 2019) that CP has a role in encouraging the construction industry to focus on green initiatives. The findings further underscore the significance of ER as a critical driver of SPM (ER → SPM: $\beta = 0.553$, t value = 11.553). This observation also aligns with past research, which posits that an intrinsic commitment to sustainability, driven by ER, can play a pivotal role in developing environmentally conscious strategies and fostering integrative capabilities. This includes coordinating efforts across different departments and functions to ensure that sustainability goals are effectively implemented and integrated throughout the organizational activities (Yue et al., 2023). Thus, ER motivates various functional units within organizations to become more inclined toward incorporating sustainability criteria into their day-to-day activities.

A unique finding of this study is identifying the most effective and well-performing driver of SPM using the IPMA technique. Past studies on SPM drivers focused on identifying the external and internal drivers, but they seldom isolate and compare them to check their distinct individual impacts (Banihashemi et al., 2017). Our study fills this gap and enriches the current understanding of SPM drivers by unveiling the dominant driver's importance and performance by conducting IPMA in SmartPLS4. The IPMA results highlighted that ER slightly outer performs CP in adopting sustainability practices in construction projects. It also appears to be more critical in aligning strategies and coordinating processes toward achieving green objectives in the long run. In general, firms tend to mitigate external pressures by immediately starting operational-level green activities in projects which, in some cases, might be of perfunctory nature and labeled as 'greenwashing' (Sabini and Alderman, 2021). However, ER originates from firms' intrinsic value its effects are relatively stable in promoting an internal ecological orientation.

This study further explored the moderating role of GTL on the relationships between CP, ER and SPM. A critical review of the extant literature reveals that the effectiveness of CP in a project context is debatable. Some published studies have identified gaps between certain aspects of CP mechanisms and sustainability practices by explicitly asserting that the regulative part of coercive pressures might not directly impact managing ecological sustainability in construction projects (Li et al., 2019). Similarly, the relationship between 'intrinsic orientation' and sustainability performance has not always shown a positive correlation (X. Wang and Bian, 2022). Considering these diverse findings of past research, this study opted to test the moderating effect of GTL by framing the hypothesis that CP and ER can perform better in the presence of green-oriented visionary leadership working at the top levels. The results of moderation analysis show that the interactions term CP*GTL (β = 0.0139, t = 4.058) and ER*GTL (β = 0.119, t = 3.434) were significant and positive. These findings show that the sustainability performance of firms will improve in the presence of green-oriented leaders at the top as they can stir a holistic internal change

process towards adopting sustainability (Zhao et al., 2016). Green transformational leaders put in place a proper sustainability assurance system and do efforts to acquire green competencies and capabilities. This helps to conform to external expectations/pressures by aligning them with internal ecological orientation (Singh et al., 2020).

6. Implications and conclusion

This research study contributes to the existing literature on SPM by highlighting the significance of CP as an external and ER as an internal SPM driver. Besides, the differential impact of CP and ER was examined in terms of their importance and relative performance by using IPMA. The moderation analysis confirmed that both CP and ER perform better in the presence of green-oriented visionary leadership at the upper echelons. Thus, our study aids to the existing SPM literature by exploring a new research model comprised of ER, CP, and GTL with support from institutional theory and green transformational leadership theory. This unique combination of both theories provides a better understanding of the external and internal factors affecting construction firms' adoption of SPM practices, a dimension overlooked in the literature. The past research on SPM received criticism for not setting the research studies within a specific theoretical context (Sabini et al., 2019). Besides, to the best of our knowledge, none of the previous study on SPM used IPMA to examine the differential impact of external and internal enablers that influence a firm's adoption of SPM practices.

From managerial perspective, the findings of this study bear value for managers and policymakers alike. Considering the growing concerns for sustainability in the corporate world, policymakers and managers need to identify the influential drivers of SPM to concentrate their efforts and allocate resources. Furthermore, integrating sustainability criteria in project management is not a straightforward process. It may require a scope shift in project management from managing time, budget, and quality to driving social and environmental impacts. Addressing these diverging yet interconnected concerns and incorporating them into project management practices poses a real challenge. Against this backdrop, the findings of this study suggest that the corporate leadership needs to work in close liaison with the regulatory bodies, suppliers, and clients for guidance and support regarding sustainability implementation in projects. Similarly, policymakers can count on the CP to generate pressure that will steer the sustainability performance of construction projects. On the other side, IPMA findings suggest that project managers should promote consciousness and passion for sustainable practices, thereby increasing the sense of ethical responsibility towards the environment and society. Managers can do this by creating internal mechanisms and allocating resources, thus preparing the firm internally 'under external pressures' to adopt sustainable practices. The findings of this study also recommend firms to promote green transformational leadership at upper tiers as they can influence the employees' constructive reaction towards sustainability issues with their visionary approach and individualized consideration behavior. This will increase the probability of 'internalizing' the SPM adoption under external pressures.

While this study is valuable from theoretical and managerial perspectives, some limitations are worth considering for future investigations. First, the findings of this study should be used with caution as the data was collected using a convenient sampling approach due to the unavailability of an exact sampling frame. Future studies may employ a probability sampling technique for better results. Second, SPM drivers were exclusively explored from the perspective of project managers. This focused perspective may introduce a bias that emphasizes the role of project managers in the success of projects. To mitigate these limitations, further investigations should involve validating the model by encompassing stakeholders and mid-level managers. Third, this study used the most appropriate manifest variables from the existing literature, where the indicators of CP, ER, and GTL are all well established. However, past research has used a diversified set of indicators for SPM, using the triple-bottom-line theory of sustainable development. As discussed in the introductory section, SPM is an emerging construct, and very few studies have used this construct in a framework-based research design. Therefore, the literature reflects diversity while measuring the construct of SPM. Therefore, this study does not claim to represent an exhaustive list of sustainability indicators for SPM research in the construction industry. Future studies may use these manifest variables but with due diligence and after following the pre-test procedures, including content validity and face validity checks. Last, this study involved testing the moderating effect of GTL but future studies can test a mediation effect of variables like top management, green innovation, resources commitment, or a moderated mediation model involving GTL.

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