

From Organisational Foundations to Sustainable Project Practices: Comparing Rival Translation Mechanisms in PMO-Enabled Sustainability

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Abstract

Organisations invest in governance, sustainability planning, knowledge management and project management office (PMO) capability, but the mechanisms linking these resources to sustainable project practices remain unclear. Using 550 complete survey responses and 5,000 bootstrap subsamples, this study compares four theory-guided PLS-SEM specifications: a direct-effects baseline, two mediation models and a reverse-order model. In the baseline, knowledge management ($\beta = .466$, $p < .001$) and PMO capability ($\beta = .351$, $p < .001$) were positively associated with sustainable practices; governance and planning/training had no significant unique direct association. In the first mediation model, PMO capability transmitted the associations of governance ($\beta_{ind} = .146$) and knowledge management ($\beta_{ind} = .191$) with practices, whereas planning/training was not an independent mediator. The distal-proximal model yielded four significant specific indirect effects but less favourable discrepancy statistics. The reverse ordering was comparatively weak. Knowledge management and PMO capability consistently appeared as proximal organisational mechanisms. High construct overlap, collinearity and the cross-sectional design limit causal and model-superiority claims. The findings emphasise the roles of organisational learning and PMO implementation capability in sustainability practice.

Keywords: *project management office; PMO capability; knowledge management; sustainability planning and training; sustainable project practices; parallel mediation; rival models; PLS-SEM*

I. INTRODUCTION

Project-based organisations frequently possess multiple resources that should, in principle, support sustainable project delivery. Governance structures define accountability and oversight. Sustainability plans establish objectives, targets and resource commitments. Training and awareness programmes develop understanding. Knowledge-management processes capture and circulate lessons. Project management offices standardise methods, coordinate resources and connect strategic priorities with project routines. The persistence of implementation gaps, however, indicates that possessing these resources is not equivalent to converting them into environmental, social and economic project practices (Aarseth et al., 2017; Kivilä et al., 2017; Martens & Carvalho, 2017).

The unresolved issue is one of organisational translation. Some resources may affect sustainable project practices directly, whereas others may operate mainly by creating capabilities through which strategic intent becomes routine action. This distinction matters because the same set of constructs can support several plausible causal orderings.

Governance can build PMO capability by clarifying authority and accountability. Knowledge management can strengthen the PMO by supplying reusable experience. Conversely, a capable PMO can institutionalise knowledge systems and governance routines. Sustainability planning and training can be viewed either as an antecedent organisational foundation or as a mechanism that transmits governance and knowledge into practice. Cross-sectional studies often select one ordering without demonstrating whether rival structures provide equally plausible explanations.

PMO research provides reasons to take these alternatives seriously. PMOs are not uniform administrative units; they may function as governance mechanisms, knowledge brokers, resource coordinators and organisational capabilities (Aubry et al., 2007; Desouza & Evaristo, 2006; Pemsell & Wiewiora, 2013). Their value depends less on their formal existence than on the routines and relationships through which they support projects (Bredillet et al., 2018; Hurt & Thomas, 2009). Knowledge management and PMO capability therefore overlap functionally, but they are not necessarily interchangeable. Knowledge processes acquire, store, share

and apply experience. PMO capability converts methods, resources and relationships into coordinated project action. Planning and training provide direction and preparedness, yet their influence may remain latent unless an implementation mechanism connects them to project decisions.

The present study addresses this ambiguity through a theory-guided comparison of four models estimated from the same data and measurement architecture. The first is a direct-effects baseline in which governance structures, knowledge management, PMO capability, and sustainability planning and training jointly predict sustainable project practices. The second positions PMO capability and sustainability planning and training as parallel mediators of governance and knowledge management. The third treats governance and sustainability planning and training as distal foundations whose effects pass through the proximal mechanisms of knowledge management and PMO capability. The fourth reverses the assumed ordering by positioning PMO capability as an antecedent of governance, knowledge management, and planning and training.

This comparison makes three contributions. First, it separates resources that retain unique direct associations from resources whose importance is primarily indirect. Second, it distinguishes distal organisational foundations from proximal implementation mechanisms, thereby clarifying why strategic plans and training may coexist with weak operating effects. Third, it treats reverse ordering as an explicit rival explanation rather than assuming that statistically estimable arrows establish temporal causality. The study does not claim that cross-sectional data can identify a definitive causal sequence. Instead, it uses path stability, specific indirect effects, explanatory power, collinearity, and model-discrepancy evidence to identify which theoretical ordering is most coherent with the observed data and which claims require further longitudinal validation.

II. THEORETICAL BACKGROUND AND RIVAL MODELS

A. Organisational translation and sustainable project practices

Sustainable project practices require sustainability to enter project selection, planning, resource allocation, stakeholder engagement, monitoring and benefits assessment. The literature has moved beyond viewing sustainability as a set of project-level environmental controls and increasingly treats it as an organisational capability that must be integrated with governance and project-management systems (Marcelino-Sádaba et al., 2015; Sabini et al., 2019; Silvius & Schipper, 2014). This organisational perspective implies a translation problem: broad commitments must be converted into routines that guide decisions across multiple projects.

Resource-based and dynamic-capability perspectives help distinguish possession from deployment. Resources can provide potential value, but the organisation requires routines that combine, apply and reconfigure them (Barney, 1991; Eisenhardt & Martin, 2000; Teece et al., 1997). Governance, planning, knowledge and PMO capability may therefore contribute at different points in a translation process. Distal foundations establish direction and legitimacy. Proximal

mechanisms process information, coordinate actors and enact routines. Treating every resource as an equivalent direct predictor obscures these functional differences.

The direct-effects baseline is nevertheless analytically necessary. It identifies whether each construct retains a unique association with sustainable project practices after the others are considered simultaneously. This baseline also reveals whether mediation claims are plausible. A weak direct coefficient does not establish irrelevance when predictors share substantial variance; it can indicate that the construct's contribution is channelled through another mechanism or absorbed by conceptually overlapping resources.

B. PMO capability as an implementation mechanism

PMO capability comprises the technical competence, resource access and relational authority required to support projects. Technical capability concerns methods, tools, standards and sustainability integration. Resource capability concerns personnel, systems and specialist input. Relational capability concerns communication, legitimacy and access to senior management and project stakeholders. Together, these dimensions allow the PMO to translate organisational priorities into repeatable project practices.

This interpretation is consistent with research portraying the PMO as more than an administrative office. PMOs can broker knowledge, coordinate portfolios, standardise routines and support strategic implementation (Desouza & Evaristo, 2006; Hadi et al., 2022; Sandhu et al., 2024; Unger et al., 2012). A PMO with these capabilities should provide a proximal pathway through which governance and knowledge resources become operational. Governance clarifies mandate and accountability; knowledge supplies experience and lessons; PMO capability converts both into tools, routines, resource decisions and cross-project coordination.

The first parallel-mediation model tests this expectation against sustainability planning and training. It asks whether PMO capability and planning/training represent two alternative mechanisms through which governance and knowledge influence practice. If PMO capability is the more proximal implementation mechanism, its indirect effects should be reliable, while the planning pathway may be weaker when training and plans are not accompanied by execution capacity.

C. Knowledge management as a proximal learning mechanism

Knowledge management supports project-based organisations by capturing experience, storing lessons, facilitating transfer and applying accumulated knowledge to new decisions. The knowledge-based view regards organisational advantage as dependent on the integration and application of specialised knowledge rather than its mere possession (Grant, 1996). PMOs can support this integration by serving as repositories, brokers and communities of practice (Desouza & Evaristo, 2006; Pemsel & Wiewiora, 2013; Tshuma et al., 2022).

Knowledge management may also operate independently of PMO capability. Sustainable project decisions require access to prior outcomes, external standards, stakeholder knowledge

and technical experience. When such knowledge is actively used in planning and decision-making, it can influence practices directly. It can additionally mediate the effects of governance and sustainability planning by transforming formal expectations into shared understanding and usable guidance.

The second parallel-mediation model treats governance structures and sustainability planning and training as distal foundations, and knowledge management and PMO capability as proximal mechanisms. Governance establishes responsibility and oversight. Planning and training create goals, awareness and preparedness. Knowledge management and PMO capability then translate these foundations into project action through learning and coordinated execution. This ordering provides a theoretically coherent distinction between organisational intent and implementation.

D. Why sustainability planning and training may not operate as an independent mediator

Sustainability planning and training are important organisational investments, but transfer into practice is not automatic. Strategic plans can remain symbolic when goals are not linked to resources, routines and accountability. Training can improve knowledge without changing behaviour when the work environment does not reinforce application. The broader training-transfer literature similarly shows that learning outcomes depend on opportunity, support and the conditions under which new competencies are applied (Aguinis & Kraiger, 2009; Baldwin & Ford, 1988).

Accordingly, planning and training may function better as distal foundations or enabling conditions than as stand-alone mediators. Their value may be realised through knowledge-management processes that convert training into shared and applied knowledge, or through PMO capability that converts plans into tools, resource allocation and monitoring. A non-significant SPT-to-practice path in a multivariate model would not imply that planning and training are unnecessary. It would indicate that their unique contribution cannot be separated from the proximal mechanisms through which implementation occurs.

E. Reverse ordering and the limits of cross-sectional mediation

A capable PMO may itself shape organisational conditions. It can introduce governance routines, establish knowledge repositories, coordinate training and influence strategic planning. This makes a capability-led ordering conceptually possible, especially in organisations where the PMO has broad authority. Testing such an inverse model is useful because it reveals whether the data are equally compatible with PMO capability as an antecedent rather than an outcome.

However, the ability to estimate a reverse model does not establish reverse causality. The constructs were measured at one point in time, from the same source, and with highly correlated perceptual measures. Temporal precedence is therefore not observed. The inverse model is treated as a rival explanatory ordering whose credibility depends on theoretical defensibility, fit, path pattern and indirect effects rather than on coefficient magnitude alone (Aguinis et al., 2017; Zhao et al., 2010).

F. Research questions and rival model expectations

Rather than presenting four mutually inconsistent sets of causal hypotheses, the study uses the following research questions to organise the rival-model comparison:

RQ1: Which organisational resources retain unique direct associations with sustainable project practices when governance, knowledge management, PMO capability and sustainability planning and training are entered simultaneously?

RQ2: When PMO capability and sustainability planning and training are modelled as parallel mediators, which mechanism transmits the effects of governance and knowledge management?

RQ3: When governance and sustainability planning and training are treated as distal foundations, do knowledge management and PMO capability function as parallel proximal mechanisms?

RQ4: Does a reverse ordering in which PMO capability precedes governance, knowledge management and sustainability planning and training provide a credible rival explanation?

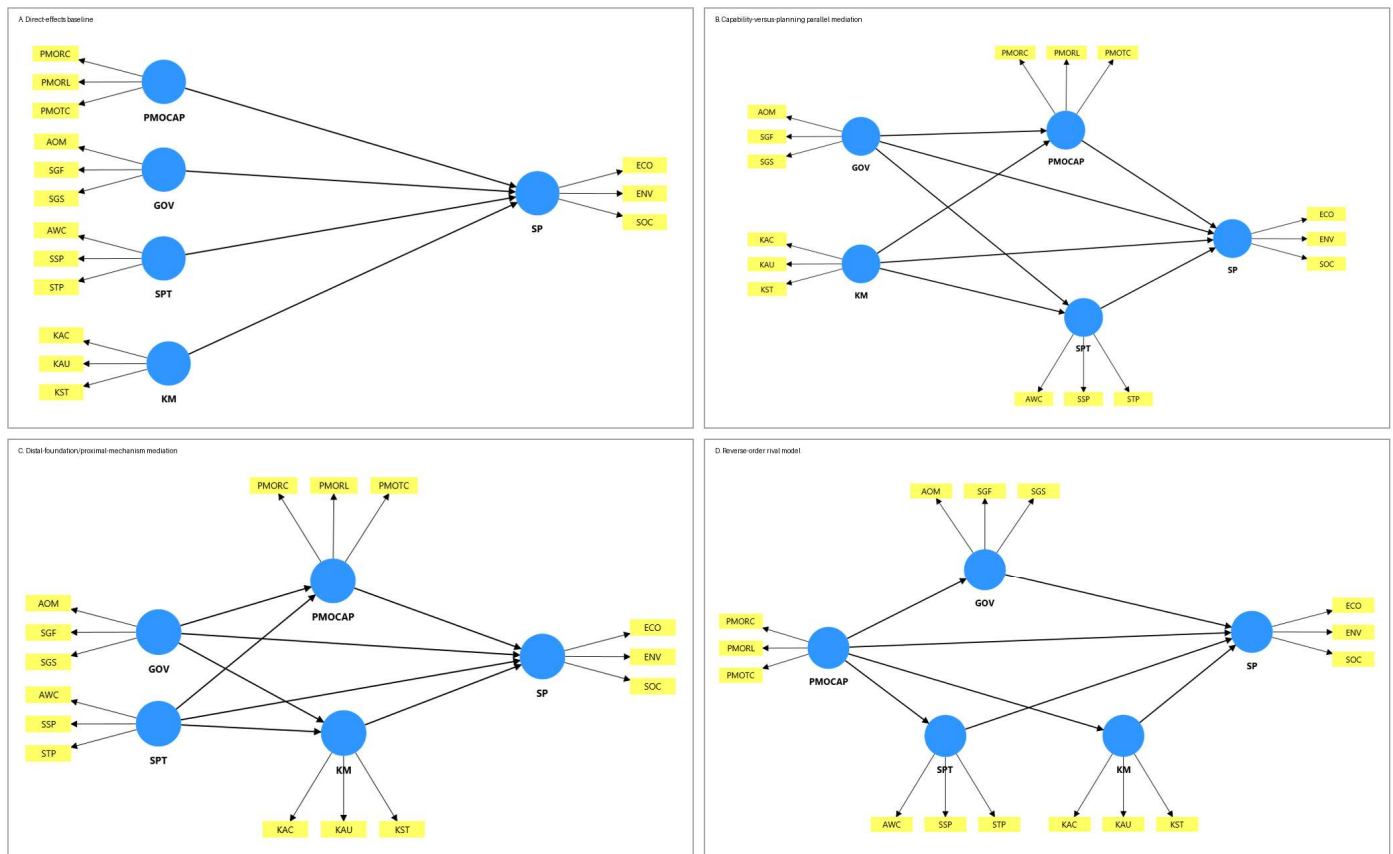


Figure 1. Four rival structural models reproduced from the SmartPLS analytical outputs.

Table 1. Definition of the rival models

Model	Antecedents	Candidate mechanisms	Outcome equation	Analytical purpose
D0: Direct baseline	GOV, KM, PMOCAP, SPT	None	GOV, KM, PMOCAP, SPT → SP	Identify unique direct associations
M1: Capability vs planning	GOV and KM	PMOCAP and SPT in parallel	GOV, KM, PMOCAP, SPT → SP	Compare PMO capability with planning/training as mediators
M2: Distal–proximal	GOV and SPT	KM and PMOCAP in parallel	GOV, KM, PMOCAP, SPT → SP	Test knowledge and capability as proximal mechanisms
R: Reverse ordering	PMOCAP	GOV, KM and SPT in parallel	GOV, KM, PMOCAP, SPT → SP	Assess capability-led rival ordering

III. RESEARCH METHOD

A. Design, sample and analytical scope

The study used a quantitative, explanatory and cross-sectional survey design. The four SmartPLS reports were estimated from the same analytical file, identified in the reports as PMO550, comprising 550 complete observations. The respondents were professionals operating in project-based organisational settings in Saudi Arabia. The same sample and measurement architecture were retained across all rival models so that differences in results reflected structural ordering rather than changes in indicators or cases.

The unit of analysis was each respondent's assessment of organisational arrangements and sustainable project practices. Because the four rival models use the same cross-sectional, single-source data, their comparison is explanatory rather than demonstrative of temporal causation.

B. Constructs and measurement

Five reflective constructs were represented by three dimension-level indicators each. Governance structures (GOV) comprised accountability and oversight mechanisms (AOM), sustainability governance framework (SGF) and stakeholder governance structures (SGS). Sustainability planning and training (SPT) comprised awareness and communication (AWC), strategic sustainability planning (SSP) and sustainability training programmes (STP).

Knowledge management (KM) comprised knowledge acquisition and use (KAU), knowledge storage and transfer (KST) and knowledge application and creation (KAC). PMO capability (PMOCAP) comprised relational (PMORL), resource (PMORC) and technical capability (PMOTC). Sustainable project practices (SP) comprised environmental (ENV), social (SOC) and economic practices (ECO).

The same measurement model was used in all four structural specifications. This consistency is important because it prevents a structural comparison from being confounded by different indicators. The direct-effects workbook was used to report the common measurement results because all four reports produced the same reliability, validity and construct-correlation pattern.

Table 2. Construct and dimension mapping

Construct	Code	Dimension-level indicators
Governance structures	GOV	AOM; SGF; SGS
Sustainability planning and training	SPT	AWC; SSP; STP
Knowledge management	KM	KAU; KST; KAC
PMO capability	PMOCAP	PMORL; PMORC; PMOTC
Sustainable project practices	SP	ENV; SOC; ECO

C. PLS-SEM estimation and rival-model comparison

The models were estimated in SmartPLS 4. Statistical significance was assessed with 5,000 bootstrap subsamples, two-tailed tests and 95% percentile confidence intervals. The evaluation followed the sequence recommended for PLS-SEM: reflective measurement assessment, structural collinearity, path coefficients, R^2 , f^2 , specific indirect effects and model-discrepancy measures (Hair et al., 2019, 2022; Nitzl et al., 2016; Sarstedt et al., 2022).

The rival models are not compared through a likelihood-ratio test because PLS-SEM does not provide the same nested-model testing framework as covariance-based SEM. Instead, the comparison considers: (a) whether theoretically required paths are significant and directionally coherent; (b) the number and pattern of supported specific indirect effects; (c) explanatory power for endogenous constructs; (d) structural collinearity; and (e) estimated-model SRMR, d_{ULS} and d_G . The discrepancy measures are used cautiously. A low SRMR can coexist with bootstrap-based exact-fit discrepancies, and the present models share highly correlated constructs.

Mediation was classified using the logic of specific indirect effects. An indirect effect with a non-significant direct effect was described as indirect-only mediation. A significant indirect effect accompanied by a direct effect in the same direction was described as complementary mediation (Zhao et

al., 2010). Because all four models retained GOV, KM, PMOCAP and SPT as direct predictors of SP, the SP outcome equation was nearly identical across models. Consequently, differences in R^2 for SP were not expected; the informative comparison lies in the antecedent equations and specific indirect effects.

IV. RESULTS

A. Measurement model assessment

All indicators loaded strongly on their intended constructs, with loadings ranging from approximately .963 to .974. Internal consistency and convergent validity were consequently very high. Composite reliability ranged from .976 to .981 and AVE ranged from .931 to .944. These results confirm that each three-indicator block was internally homogeneous.

The same evidence also requires caution. Cronbach's alpha and composite reliability values above .95 can indicate indicator redundancy. More importantly, several HTMT values exceeded .90, including GOV–SPT (.962), KM–SPT (.961), KM–PMOCAP (.954), GOV–KM (.948), GOV–PMOCAP (.942), and KM–SP (.933). The measurement blocks are therefore highly proximate, and discriminant validity is not established under conservative criteria (Henseler et al., 2015; Rönkkö & Cho, 2022). The structural coefficients should be interpreted as unique effects conditional on a set of strongly overlapping organisational constructs rather than as cleanly isolated causal contributions.

Table 3. Reliability and convergent validity common to the four models

Construct	Cronbach's α	rho A	Composite reliability	AVE
GOV	.965	.965	.977	.934
KM	.964	.964	.977	.933
PMOCAP	.970	.970	.981	.944
SP	.971	.971	.981	.944
SPT	.963	.963	.976	.931

Table 4. HTMT matrix

Construct pair	HTMT	Interpretive note
GOV–KM	.948	Above .90
GOV–PMOCAP	.942	Above .90

Construct pair	HTMT	Interpretive note
GOV-SP	.890	Below .90, but close
GOV-SPT	.962	Above .90
KM-PMOCAP	.954	Above .90
KM-SP	.933	Above .90
KM-SPT	.961	Above .90
PMOCAP-SP	.918	Above .90
PMOCAP-SPT	.935	Above .90
SP-SPT	.898	Below .90, but close

B. Direct-effects baseline

The direct model explained 83.9% of the variance in sustainable project practices. Knowledge management and PMO capability retained significant positive associations with SP, whereas governance and sustainability planning and training did not. The largest unique coefficient was $KM \rightarrow SP$ ($\beta = .466$, $p < .001$), followed by $PMOCAP \rightarrow SP$ ($\beta = .351$, p

$< .001$). $GOV \rightarrow SP$ ($\beta = .033$, $p = .627$) and $SPT \rightarrow SP$ ($\beta = .088$, $p = .229$) were not significant.

The result answers RQ1: the data identify knowledge management and PMO capability as the two resources closest to sustainable project practices when all four constructs are considered simultaneously. The non-significant GOV and SPT coefficients do not demonstrate that governance or planning are unimportant. Their high correlations with KM and PMOCAP and their very high inner VIF values indicate that much of their explanatory variance is shared.

Table 5. Direct-effects baseline results

Path	β	t	p	95% percentile CI	f ²	Decision
GOV $\rightarrow$ SP	.033	.485	.627	[-.107, .162]	.001	Not significant
KM $\rightarrow$ SP	.466	6.889	< .001	[.334, .601]	.133	Significant
PMOCAP $\rightarrow$ SP	.351	5.068	< .001	[.219, .491]	.091	Significant
SPT $\rightarrow$ SP	.088	1.204	.229	[-.055, .229]	.005	Not significant

C. Model M1: PMO capability versus planning and training as mediators

Model M1 positioned governance and knowledge management as antecedents of two parallel mediators: PMO capability and sustainability planning and training. Governance and knowledge management significantly predicted both candidate mediators. PMO capability then predicted sustainable project practices, whereas SPT did not. The model explained 87.9% of PMO capability, 89.7% of sustainability planning and training, and 83.9% of sustainable project practices.

The specific indirect effects provide the central result. Governance influenced SP through PMO capability ($\beta_{ind} = .146$, $p < .001$), and knowledge management influenced SP

through PMO capability ($\beta_{ind} = .191$, $p < .001$). Neither indirect pathway through SPT was significant. Because $GOV \rightarrow SP$ remained non-significant, the governance pathway represents indirect-only mediation through PMO capability. KM retained a strong direct effect on SP while also operating through PMO capability, indicating complementary mediation.

Model M1 therefore supports a selective rather than dual-mediation interpretation. PMO capability functions as an effective implementation mechanism. Sustainability planning and training, despite being strongly predicted by governance and knowledge management, does not transmit their effects to practice after KM and PMO capability are included in the outcome equation. This pattern answers RQ2 and indicates that plans and training are not equivalent to implementation capability.

Table 6. Model M1 specific indirect effects

Specific indirect path	β_{ind}	t	p	95% percentile CI	Interpretation
GOV $\rightarrow$ PMOCAP $\rightarrow$ SP	.146	4.128	< .001	[.085, .221]	Supported; indirect-only
KM $\rightarrow$ PMOCAP $\rightarrow$ SP	.191	4.532	< .001	[.113, .280]	Supported; complementary
GOV $\rightarrow$ SPT $\rightarrow$ SP	.043	1.150	.250	[-.026, .121]	Not supported
KM $\rightarrow$ SPT $\rightarrow$ SP	.042	1.216	.224	[-.026, .108]	Not supported

D. Model M2: Governance and planning as distal foundations; knowledge and capability as proximal mechanisms

Model M2 changed the causal ordering without changing the final SP equation. Governance and SPT were treated as distal antecedents of knowledge management and PMO capability. All four antecedent-to-mechanism paths were positive and significant. Governance predicted KM ($\beta = .395$) and PMO capability ($\beta = .523$), while SPT predicted KM ($\beta = .560$) and PMO capability ($\beta = .419$). KM and PMO capability retained the same positive paths to SP, and the direct paths from GOV and SPT to SP remained non-significant.

All four specific indirect effects were significant. Governance influenced SP through KM and PMO capability, while SPT influenced SP through both mechanisms. SPT $\rightarrow$ KM $\rightarrow$ SP was the largest indirect effect ($\beta_{\text{ind}} = .261$),

followed by GOV $\rightarrow$ KM $\rightarrow$ SP and GOV $\rightarrow$ PMOCAP $\rightarrow$ SP (both approximately .184) and SPT $\rightarrow$ PMOCAP $\rightarrow$ SP (.147). Both governance and SPT therefore exhibited indirect-only parallel mediation.

This is the most complete mediation pattern among the tested models and provides substantive support for the distal-foundation/proximal-mechanism distinction. It suggests that governance and sustainability planning create organisational conditions, but their effects reach practice through knowledge application and PMO execution capability. However, the model's estimated SRMR, d_{ULS} and d_{G} were less favourable than those of M1, and collinearity in the mediator equations increased. The result should therefore be understood as theoretically coherent evidence rather than definitive statistical superiority.

Table 7. Model M2 specific indirect effects

Specific indirect path	β_{ind}	t	p	95% percentile CI	Interpretation
GOV $\rightarrow$ KM $\rightarrow$ SP	.184	5.230	< .001	[.119, .256]	Supported; indirect-only
GOV $\rightarrow$ PMOCAP $\rightarrow$ SP	.184	4.641	< .001	[.114, .267]	Supported; indirect-only
SPT $\rightarrow$ KM $\rightarrow$ SP	.261	6.002	< .001	[.180, .352]	Supported; indirect-only
SPT $\rightarrow$ PMOCAP $\rightarrow$ SP	.147	3.749	< .001	[.080, .232]	Supported; indirect-only

E. Reverse-order rival model

The reverse model treated PMO capability as the antecedent of governance, knowledge management and sustainability planning and training. The paths from PMO capability to the three candidate mediators were extremely large: .911 to governance, .922 to knowledge management and .904 to SPT. These values produced R^2 values of .831, .851 and .817, respectively. Such magnitudes are consistent with the severe construct overlap observed in the measurement model and should not be interpreted as evidence of temporal causation.

Only the indirect effect through knowledge management was supported ($\beta_{\text{ind}} = .430$, $p < .001$). The pathways through governance and SPT were not significant because neither

construct retained a significant path to SP. PMO capability also retained a direct effect on SP, producing complementary partial mediation through KM.

Although the reverse model can be estimated and generates a strong total PMOCAP effect, it provides the weakest overall rival explanation. Its estimated-model SRMR was .045, compared with .014 in M1 and .021 in M2, while d_{ULS} and d_{G} were substantially larger. The estimated discrepancy values exceeded their bootstrap reference values by a wide margin. Combined with the cross-sectional design and the theoretical difficulty of treating organisational governance as an outcome of PMO capability, the reverse model is better regarded as a sensitivity test than as the preferred ordering. This answers RQ4.

Table 8. Reverse-order specific indirect effects

Specific indirect path	β_{ind}	t	p	95% percentile CI	Interpretation
PMOCAP $\rightarrow$ KM $\rightarrow$ SP	.430	6.909	< .001	[.309, .555]	Supported; complementary
PMOCAP $\rightarrow$ SPT $\rightarrow$ SP	.079	1.201	.230	[-.049, .207]	Not supported
PMOCAP $\rightarrow$ GOV $\rightarrow$ SP	.030	.484	.629	[-.099, .147]	Not supported

F. Comparative model synthesis

Table 9 synthesises the rival-model evidence. The R^2 for SP remained approximately .839 across all four models because the same four constructs directly predicted SP in every specification. The model comparison must therefore focus on mediation patterns, antecedent equations and discrepancy evidence rather than on SP R^2 .

The direct model produced the lowest estimated SRMR, closely followed by M1. M1 combined a low SRMR with a theoretically interpretable pattern in which PMO capability, but not SPT, transmitted governance and knowledge effects. M2 generated the strongest mediation pattern, with four supported specific indirect effects, but its estimated

discrepancy measures were less favourable and the VIF values in the mediator equations were higher. The reverse model had the clearest deterioration in estimated-model fit and only one supported mediating mechanism.

None of the models fully satisfied the bootstrap-based exact-fit reference values for d_{ULS} and d_{G} . The comparison therefore does not justify declaring a single model statistically true. Instead, the convergent substantive conclusion is that knowledge management and PMO capability are proximal mechanisms, while governance and SPT operate more plausibly as foundations whose value depends on those mechanisms.

Table 9. Comparative summary of the four rival models

Criterion	D0 Direct	M1 Capability vs planning	M2 Distal-proximal	R Reverse
R ² for SP	.839	.839	.839	.839
Additional endogenous R ²	—	PMOCAP .879; SPT .897	KM .880; PMOCAP .855	GOV .831; KM .851; SPT .817
Supported specific indirect effects	Not applicable	2 of 4	4 of 4	1 of 3
Estimated SRMR	.0135	.0141	.0211	.0453
Estimated d ULS	.0219	.0240	.0535	.2465
Estimated d G	.2113	.2110	.2248	.3549
Maximum inner VIF	10.175	10.177	10.175	10.177
Substantive reading	Unique direct effects	Selective PMOCAP mediation	Complete proximal parallel mediation	Weak reverse rival ordering

Important interpretive boundary: the four models were estimated on the same cross-sectional dataset and are not adjudicated by a likelihood-based nested-model test. The comparative conclusion is based on convergence among theory, path stability, indirect effects and discrepancy evidence, not on proof of temporal causality.

V. DISCUSSION

A. Knowledge management and PMO capability are the proximal mechanisms

The most stable finding across the four models is the proximity of knowledge management and PMO capability to sustainable project practices. Their direct coefficients were positive and significant in every model in which the same outcome equation was estimated. By contrast, governance and sustainability planning and training did not retain unique direct paths. This pattern indicates that sustainable practices depend less on the formal presence of policies or plans than on mechanisms that process knowledge and coordinate implementation.

Knowledge management provides the learning mechanism. It enables organisations to acquire external knowledge, capture lessons, share expertise and apply accumulated experience to project decisions. PMO capability provides the execution mechanism. It converts organisational priorities into methods, resources, relationships and oversight routines. The findings therefore support a two-mechanism view of organisational translation: learning makes sustainability knowledge usable, and capability makes sustainability action repeatable.

This distinction extends knowledge-broker conceptions of the PMO. Prior research shows that PMOs store and transfer project knowledge (Desouza & Evaristo, 2006; Pemsel & Wiewiora, 2013; Tshuma et al., 2022). The present results suggest that knowledge and PMO capability should not be collapsed into one function. Knowledge management retains a direct contribution to practice, while PMO capability also mediates part of the knowledge effect. A capable PMO can institutionalise knowledge, but knowledge processes continue to supply adaptation and learning.

B. Planning and training are foundations, not self-executing mechanisms

The rival models clarify the ambiguous role of sustainability planning and training. In M1, governance and knowledge strongly predicted SPT, but SPT did not predict practice and did not mediate either antecedent. In M2, SPT became a powerful distal antecedent of both knowledge management and PMO capability, and its indirect effects through those mechanisms were significant. The difference is not a contradiction. It shows that planning and training are valuable when they build learning and execution capability, but they do not constitute an independent implementation mechanism in the presence of those proximal resources.

This interpretation is consistent with the training-transfer literature and with project sustainability research that distinguishes formal commitment from embedded practice. Training can raise awareness, and strategic planning can establish goals, but the work environment must provide opportunities, methods, authority and reinforcement. In practical terms, organisations should not assess sustainability planning by the number of plans produced or employees trained. They should examine whether training changes knowledge-sharing and application, and whether plans are converted into PMO standards, resource decisions, controls and stakeholder routines.

C. Governance exerts influence through translation mechanisms

Governance displayed a similar pattern. Its direct coefficient was negligible when entered with the other organisational resources. Yet governance generated significant indirect effects in both mediation models through PMO capability and, in M2, through knowledge management. Governance therefore appears to matter by shaping the conditions under which proximal mechanisms operate.

This result refines project-governance theory. Governance structures can define accountability, decision rights and

stakeholder participation, but their practical value depends on whether knowledge and capability convert these arrangements into behaviour. A governance framework without knowledge use or implementation capacity may be formally elaborate but operationally weak. Conversely, a capable PMO with access to knowledge can make governance visible in project methods, assurance and reporting (Too & Weaver, 2014).

D. What the reverse model adds

The reverse model is useful despite not being preferred. It shows that PMO capability can be strongly associated with the presence of governance, knowledge and planning arrangements. In mature organisations, these elements may co-evolve rather than follow a simple one-way sequence. PMOs can develop knowledge systems and governance routines, while those systems simultaneously strengthen the PMO.

The reverse model's weaker estimated fit and selective mediation nevertheless caution against positioning PMO capability as the universal origin of the organisational system. The extremely high PMOCAP-to-mediator coefficients are more plausibly read as evidence of common organisational development and measurement proximity than as proof that capability temporally causes governance and planning. Longitudinal studies should test reciprocal or cross-lagged relationships rather than choosing one direction on the basis of cross-sectional coefficients.

E. Theoretical contributions

The study offers four theoretical contributions. First, it introduces a rival-model approach to PMO-enabled sustainability. Rather than presenting one mediation structure as self-evident, it compares direct, parallel and reverse orderings and identifies which conclusions survive those alternatives.

Second, it distinguishes distal foundations from proximal translation mechanisms. Governance and sustainability planning establish direction, legitimacy and preparedness. Knowledge management and PMO capability are closer to implementation because they process experience and coordinate action. This distinction explains why organisations can possess formal sustainability arrangements without consistently enacting sustainable practices.

Third, the findings specify selective mediation. PMO capability reliably mediates governance and knowledge effects when compared directly with planning and training. Knowledge management also functions as a mediator when governance and planning are treated as antecedent foundations. The organisational system therefore does not contain a single universal mediator; it contains differentiated mechanisms whose relevance depends on their functional location.

Fourth, the study demonstrates that more significant indirect effects do not automatically establish a superior model. M2 produced four supported indirect paths but less favourable discrepancy statistics than M1. The result reinforces the need to judge mediation models through theoretical coherence,

measurement quality, collinearity and rival explanations rather than through p-values alone.

F. Practical implications

For executives and PMO leaders, the findings suggest that investments should be sequenced around translation rather than isolated initiatives. Governance frameworks should define accountability and decision rights, but they should also specify how lessons are captured, who converts sustainability requirements into project methods, and how compliance is supported with resources.

Sustainability plans and training should be connected to two implementation systems. The first is knowledge management: repositories, communities of practice, lessons learned, external knowledge acquisition and mechanisms for applying knowledge in planning and decision-making. The second is PMO capability: technical tools, resource access, relational authority and portfolio-level coordination. Without these links, planning and training may create awareness without consistent practice.

Organisations should also avoid treating the PMO as a substitute for knowledge processes. The direct and indirect effects of knowledge management show that knowledge remains important even when PMO capability is strong. The PMO should institutionalise and broker knowledge rather than centralise it so completely that learning becomes detached from project teams.

VI. LIMITATIONS AND FUTURE RESEARCH

Several limitations materially affect interpretation. First, the design is cross-sectional. Temporal precedence among governance, planning, knowledge and PMO capability cannot be observed, and mediation coefficients should not be described as proof of causal sequence. Time-lagged data, cross-lagged panel designs or process studies are needed to test whether distal foundations precede proximal mechanisms.

Second, all constructs were assessed through the same questionnaire and respondent. Common method variance may contribute to the unusually high correlations, reliability coefficients and R^2 values. Future research should combine PMO assessments, project-team responses, archival governance evidence and objective or independently rated sustainability outcomes.

Third, discriminant validity and collinearity are major concerns. Several HTMT values exceeded .90, and VIF values in the SP equation ranged from approximately 8.4 to 10.2. The path coefficients therefore represent unstable unique effects among strongly overlapping constructs. A subsequent validation study should compare the five-factor model with a higher-order organisational sustainability infrastructure construct, an ESEM or bifactor alternative, and a common-method-factor model.

Fourth, the rival models were compared using PLS-SEM path patterns and discrepancy measures rather than a formal likelihood-based nested-model test. Predictive comparison using PLSpredict or a holdout sample was not available in the

four reports. Out-of-sample prediction would provide a stronger basis for determining whether the additional structural complexity of M1 or M2 improves practical forecasting.

Fifth, the study was conducted in one national and organisational context. PMO authority, governance structures and sustainability expectations may differ across sectors and institutional environments. Replication should examine whether the distal–proximal distinction is stable across PMO centralisation, maturity, project type and regulatory intensity.

VII. CONCLUSION

This study compared four plausible explanations of how organisational resources become sustainable project practices. The direct model showed that knowledge management and PMO capability are the resources with the strongest unique proximity to practice. The first mediation model demonstrated that PMO capability, but not sustainability planning and training, selectively transmits governance and knowledge effects. The second model showed that governance and planning can exert broad indirect effects when knowledge management and PMO capability are positioned as proximal mechanisms. The reverse model confirmed that capability-led ordering is statistically estimable but theoretically and empirically weaker.

The overall conclusion is not that governance or sustainability planning are unimportant. Their importance is realised through mechanisms that translate formal intent into knowledge use and coordinated execution. Sustainable project practices are most likely when organisations combine governance and planning foundations with active knowledge management and a technically, relationally and resource-capable PMO. Future longitudinal and multi-source research should test this ordering directly and determine whether the four constructs are empirically distinct or dimensions of a broader organisational sustainability infrastructure.

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Appendix A. Direct Paths to Sustainable Project Practices Across the Rival Models

Path	D0 β	M1 β	M2 β	Reverse β	Stability
GOV $\rightarrow$ SP	.033	.033	.033	.033	Consistently non-significant
KM $\rightarrow$ SP	.466	.466	.467	.466	Consistently positive and significant
PMOCAP $\rightarrow$ SP	.351	.351	.351	.351	Consistently positive and significant
SPT $\rightarrow$ SP	.088	.088	.088	.088	Consistently non-significant

The near-identical coefficients arise because all four models use the same predictor set in the SP equation. Repositioning constructs changes the mediator equations and the indirect effects, not the final regression of SP on GOV, KM, PMOCAP and SPT.