Comprehensive Journal of Science
Volume (10), Issue (39), (March, 2026)
ISSN: 3014-6266

مجلة العلوم الشاملة
المجلد (10) العدد 39 مارس 2026
ردمد: 3014-6266

Organisational Resources and Multi-Criteria Decision-Making Adoption in Libya's Public Construction Sector: The Mediating Role of Government Support

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تاريخ الاستلام:2026/01/09 –تاريخ المراجعة: 2026/02/04– تاريخ القبول: 2026/02/16– تاريخ للنشر :2026 /03/15

Abstract:
This study investigates how internal organisational resources and external institutional support jointly shape Multi-Criteria Decision-Making (MCDM) adoption in Libyan public construction organisations. Organisational resources are modelled as a higher-order reflective construct comprising transformational leadership and organisational learning, with government support specified as a mediating mechanism linking these resources to MCDM adoption. Data were gathered through a cross-sectional survey of 97 respondents from public construction organisations operating in the western region of Libya using a five-point Likert scale. The measurement and structural models were assessed using partial least squares structural equation modelling (PLS-SEM) in SmartPLS 4. The findings indicate that organisational resources have a strong positive effect on government support, which in turn exerts a substantial positive effect on MCDM adoption. In contrast, the direct effect of organisational resources on MCDM adoption is not significant. The significant indirect pathway supports a full mediation pattern, with the model explaining 37.2% of the variance in MCDM adoption and exhibiting acceptable predictive relevance. Overall, the results suggest that capable leadership and learning-oriented cultures may be necessary but are unlikely to be sufficient on their own; sustained government support, including policies, standards, training, and digital platforms, appears essential for institutionalising MCDM and strengthening transparent, evidence-based decision-making in Libya's public construction sector.

Keywords: Transformational leadership style, organisational learning, Multi-Criteria Decision-Making, Libyan construction industry.

1 Introduction

Multi-criteria decision-making (MCDM) approaches such as AHP, TOPSIS, and PROMETHEE are increasingly used in construction to support choices that involve competing criteria, including contractor selection, design evaluation, and sustainability assessment (Jato-Espino, D., Castillo-Lopez, E., Rodríguez-Hernández, J., & Canteras-Jordana, J. C., 2014). This diffusion is also evident across civil-engineering applications more broadly, where MCDM can help decision makers articulate and compare trade-offs among time, cost, quality, and risk in a more structured way (Zavadskas, Antuchevičienė & Kapliński 2016). In principle, such structuring is particularly relevant in project environments where information is incomplete, priorities are contested, and accountability requirements are high.

In Libya, however, public construction projects continue to experience persistent schedule overruns, which empirical studies commonly associate with weak planning, slow public-sector decision processes, and financing constraints (Tumi, Omran & Pakir 2009; Salam & Gaith, 2020; Gebril, 2025). Under these conditions, decisions about resource allocation and project priorities are often made under pressure and scrutiny, which can heighten the value of transparent and defensible decision frameworks. Yet the adoption of analytical tools like MCDM is unlikely to be determined by technique availability alone; it may depend on whether organisations have the internal capabilities and the external institutional backing needed to embed such practices in routine decision processes.

From a resource-based view, organisational resources that are valuable, rare, inimitable, and non-substitutable can underpin sustained advantage, while dynamic capabilities emphasize the importance of reconfiguring resources in response to environmental turbulence (Barney, 1991; Teece, 2007). Organisational learning (OL) further specifies how insights move from individual intuition to institutionalised routines, offering a plausible mechanism through which new practices can become embedded in day-to-day operations (Crossan, Lane, & White, 1999). In public construction organisations, transformational leadership (TL) and organisational learning therefore represent salient intangible resources that may shape whether structured decision tools such as MCDM are adopted and used consistently.

Even so, emerging evidence suggests that learning-oriented cultures and analytic capabilities are often most consequential when they are coupled with supportive institutional arrangements that reduce implementation barriers and legitimise new practices (Azizi, 2017; Chatterjee & colleagues, 2023). Related work in developing-country construction contexts indicates that government engagement, legal frameworks, and targeted incentives can be pivotal for digital and analytical transformation, especially where standards, training, and enabling platforms are still evolving (Rinchen, Banihashemi & Alkilani, 2024; Tanoli, 2025). Against this background, the present quantitative study examines how organisational resources operationalised as transformational leadership style and organisational learning affect MCDM adoption in Libyan government construction organisations, and whether government support (GS) mediates these relationships. All three constructs (organisational resources, government support, and MCDM adoption) are modelled as reflective latent variables to align with prevailing measurement practice in management and construction research.

2 Literature Review

2.1 Libyan construction industry

Across two decades of evidence, the picture of project delivery in Libya is broadly consistent: delays tend to stem from interlocking technical, managerial, and institutional frictions rather than a single dominant cause. Tumi *et al*., (2009) identify improper planning, weak communication, design errors, material shortages, slow decision-making, and financial problems as dominant delay factors in Libyan construction projects. similarly, emphasise public-client and contract-system constraints government-related obstacles, delayed client payments, poor contract management, and sluggish decisions by public clients as critical causes of delay in Libyan highway projects (Salam & Gaith, 2020). More recently, Gebril (2025) confirms that slow administrative decisions, inadequate contractor capabilities, and financing constraints continue to drive time and cost overruns in Libyan public works.

Taken together, these studies suggest a public-sector-dominated industry in which fragmented coordination and unstable funding can weaken the quality and timeliness of project decisions, particularly in infrastructure and building projects procured by government agencies. Under such conditions, decisions about project selection, contractor evaluation, and technology choices may be more exposed to ad-hoc judgement, shifting priorities, or limited information. At the same time, pressure to rehabilitate ageing infrastructure and address post-conflict

backlogs increases the consequences of weak decision routines, because misallocation of scarce resources can compound schedule slippage and cost escalation.

Within this context, Libyan government construction organisations may require organisational capabilities that stabilise decision processes, make trade-offs explicit across criteria (cost, time, quality, risk, and socio-economic priorities), and align project choices with strategic reconstruction goals. MCDM adoption in such construction organisations is therefore not only a technical matter; it is plausibly shaped by internal resources such as leadership and learning and by the enabling or constraining role of government support.

2.2 Organisational Resources in Public Construction Organisations

Drawing on the resource-based view, Jay Barney argues that sustained advantage depends on resources that are valuable, rare, imperfectly imitable, and non-substitutable, a logic that directs attention in public construction organisations to hard-to-replicate intangibles such as leadership capability, organisational culture, and organisational knowledge (Barney, 1991). Extending this perspective, David Teece defines dynamic capabilities as higher-order routines through which organisations sense opportunities and threats, seize them via timely commitments, and reconfigure assets to sustain performance under environmental change (Teece, 2007). Complementing this dynamic view, Crossan *et al.* (1999) conceptualise organisational learning as a multilevel process of intuiting, interpreting, integrating, and institutionalising, whereby experience becomes embedded in routines and practices.

In public construction sector, formal procedures and political oversight can restrict discretion and slow experimentation, which makes intangible resources particularly consequential for whether analytical practices become routinised rather than remaining episodic. Transformational leadership and a learning-oriented culture are therefore salient because they shape how managers interpret external cues (e.g., regulatory changes and donor requirements), prioritise investments in tools and skills, and institutionalise improved procurement and project-management routines. Azizi (2017) provides evidence that organisational learning capability strengthens the relationship between strategic initiatives and sustainable performance, implying that learning processes can condition how resources are translated into outcomes. In this study, organisational resources are accordingly conceptualised as a higher-order reflective construct comprising transformational leadership style and organisational learning capability, both of which are expected to influence whether Libyan government construction organisations adopt MCDM methods.

2.3 Transformational Leadership in Construction Projects

Transformational leadership is described as a style characterised by idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration that elevates followers' goals and aligns them with organisational purposes (Bass & Avolio, 1994). In developing-country construction contexts, Ofori (2008) argues that leadership is a critical but under-developed lever for construction industry development and calls for more value-based and strategic leadership practices in project organisations. Empirical evidence supports this emphasis. Liphadzi, Aigbavboa, and Thwala (2015) show that transformational leadership behaviours are positively associated with project success in the South African construction industry, particularly through stakeholder satisfaction and team performance. Similarly, Garcés (2020) reports that leadership qualities such as communication, motivation, and ethical conduct significantly influence outcomes in building refurbishment projects

Collectively, these studies imply that transformational leadership can shape the climate in which staff feel permitted to question routines, trial structured tools, and share knowledge about better decision practices. This mechanism is especially relevant in public construction organisations, where adopting MCDM may initially be viewed as complex, time-consuming, or administratively burdensome. Transformational leaders may therefore be important for legitimising the effort required to learn and apply formal multi-criteria techniques, allocating

attention to evidence-based decision-making, and sustaining implementation long enough for new practices to become normalised. In this research, transformational leadership is treated as a reflective dimension of organisational resources that should foster MCDM adoption by signalling support, providing vision, and directing managerial focus toward structured decision processes.

2.4 Organisational Learning as a Dynamic Capability

Crossan *et al.* (1999) propose that organisational learning operates through linked individual, group, and organisational processes that both feed forward into institutionalised routines and feed back to shape future intuition and interpretation. Building on this process view, Teece (2007) places these learning mechanisms at the core of dynamic capabilities, arguing that sensing, seizing, and reconfiguring depend on systematically exploring new knowledge, integrating it across functions, and embedding it in organisational systems and structures. Empirical evidence is consistent with this logic, Azizi (2017) finds that organisations with stronger organisational learning capability achieve better sustainable performance, partly because they implement and refine strategic initiatives more effectively. Chatterjee *et al*. (2023) similarly show that data-driven cultures and analytics-oriented learning processes strengthen the impact of big-data analytics on decision quality and competitiveness.

For public construction organisations, organisational learning as a dynamic capability implies routines for capturing lessons from past projects, integrating external knowledge (standards, donor guidelines, and digital tools), and updating procedures accordingly. When learning routines are robust, teams may be more willing and able to pilot MCDM, reflect on its usefulness for procurement and planning, and then institutionalise it within standard operating procedures. In this study, organisational learning is conceptualised as a reflective first-order construct under the broader organisational resources factor, expected to positively influence MCDM adoption in Libyan government construction organisations.

2.5 MCDM in Construction Management

Two major reviews provide a foundation for why MCDM is viewed as a core decision-support approach in construction and civil engineering. Jato-Espino *et al.* (2014) review 25 MCDM methods applied in construction and report growing use of techniques such as AHP, TOPSIS, VIKOR, and PROMETHEE for problems including contractor selection, material choice, route alignment, and sustainability assessment. MCDM methods have similarly become central in civil engineering decision support because they integrate technical, economic, environmental, and social criteria within a single evaluation logic (Zavadskas *et al.,* 2016). At an applied level, Erdoğan, Šaparauskas and Turskis, (2019) demonstrate an AHP-based model for selecting sustainable construction management strategies, illustrating how criteria hierarchies and stakeholder judgements can produce transparent and robust choices under complexity.

However, the same literature implies a recurrent implementation challenge: diffusion in research and specialised consultancy does not necessarily translate into routine organisational use. In spite of global uptake, MCDM adoption in practice appears uneven, suggesting that organisational readiness and institutional conditions may determine whether formal techniques are embedded or remain occasional. This concern is consistent with Andrew McAfee and Brynjolfsson's (2012) argument that organisations that embed data-driven decision-making can outperform those relying mainly on intuition, highlighting the strategic value of analytical routines when they are institutionalised rather than sporadic. Accordingly, this study conceptualises MCDM adoption in Libyan government construction organisations as a reflective construct capturing the extent to which managers systematically use formal multi-criteria techniques in project selection, contractor evaluation, and technology or material choices.

2.6 Government Support for Digital and Analytical Decision-Making in the Construction Sector

The literature on digital transformation in construction reinforces the idea that institutional context can materially shape whether analytical tools become standard practice. Rinchen *et al.* (2024) conclude that government engagement, legal frameworks, financial incentives, and education policies are pivotal drivers of digital transformation in construction organisations in developing countries. They further emphasise that government-led pilots, clear contractual standards, and public funding programmes can be necessary conditions for the industry-wide uptake of tools such as BIM and related analytical platforms. Tanoli (2025) reports that digitalisation in Pakistan's construction industry remains limited and uneven, yet coordinated policy interventions, including standards, regulation, training, and support schemes, can accelerate adoption and strengthen the governance of infrastructure delivery.

These studies collectively highlight a practical constraint that is especially salient in developing and post-conflict settings: when government is both the dominant client and the regulator, it can either enable diffusion through standards and capacity building or inadvertently inhibit it through ambiguous rules, weak incentives, or limited infrastructure. In Libya, ministries and public agencies not only commission major infrastructure projects but also define procurement rules, auditing requirements, and reporting templates. Within this study, government support is conceptualised as a reflective construct capturing managers' perceptions of policy clarity, financial and technical assistance, and institutional encouragement for using digital and analytical decision-making tools such as MCDM in government construction projects.

2.7 Relationships Between Organisational Resources and MCDM Adoption

Big-data analytics capabilities tend to translate into stronger decision quality and competitive outcomes when they are reinforced by leadership support and a culture that values data-driven learning (Chatterjee *et al.,* 2023). This emphasis on complementary organisational conditions is consistent with Andrew McAfee and Brynjolfsson (2012), who argue that systematic data-driven decision-making is associated with superior organisational performance, while also noting that such practices depend on sustained managerial commitment and the availability of relevant skills.

Within construction, the leadership pathway is further supported by evidence that transformational leadership behaviours are associated with higher project success, implying that leaders who articulate direction, motivate teams, and legitimise change may be more willing to champion unfamiliar practices and tools (Liphadzi *et al.,* 2015). In parallel, the learning pathway is reflected in findings that organisational learning capability can strengthen the conversion of strategic initiatives into sustainable performance, suggesting that learning processes help transform intentions into routinised practices rather than remaining aspirational (Azizi, 2017).

Taken together, these strands align with the resource-based and dynamic-capabilities perspectives in implying that transformational leadership and organisational learning treated here as dimensions of organisational resources should support MCDM adoption by encouraging experimentation, prioritising training, and embedding analytical routines in day-to-day work. However, the literature also implies an important boundary condition: in heavily regulated public-sector contexts, internal readiness may not, on its own, be sufficient for systematic tool use, which motivates examination of the mediating role of government support.

2.8 The Mediating Role of Government Support Between Organisational Resources and MCDM Adoption

The Libyan public construction sector may exhibit internal readiness for MCDM and related analytical decision tools, yet adoption can still stall when government engagement, regulatory alignment, and credible public-sector exemplars are limited (Rinchen *et al.,* 2024). In this regard, Tanoli (2025) suggests that the transition from isolated pilots to broader institutionalisation often depends on policy instruments that reduce uncertainty and coordinate

expectations, including standards, procurement requirements, and targeted support programmes.

From a dynamic-capabilities viewpoint, government support can therefore be interpreted as an external enabling mechanism that shapes whether internal organisational resources generate tangible returns, because sensing and seizing opportunities are conditioned by institutional and regulatory contexts that may reward, constrain, or penalise particular strategic choices (Teece, 2007). Applied to the Libyan public construction sector, transformational leadership and learning-oriented practices may increase the willingness to use MCDM; however, high perceived risk, unclear rules, or weak formal recognition may still discourage adoption even when such internal capabilities are present.

Accordingly, this study posits that government support mediates the relationship between organisational resources and MCDM adoption. When supportive policies, standards, and incentives are perceived to be in place, the organisations is more likely to move towards the investment in and institutionalisation of MCDM practices; when support is weak, internal resources may not translate into the systematic use of analytical decision tools. Testing this mediation in a reflective structural model responds to a gap in the literature, where internal capabilities and external policy conditions are often examined in isolation rather than jointly.

2.9 Summary of the Literature and Research Gaps

The reviewed literature converges on three points: transformational leadership and organisational learning are salient organisational resources; MCDM methods offer structured support for complex construction decisions; and government policy can materially shape the diffusion of digital and analytical approaches in construction (Barney, 1991; Crossan *et al.,* 1999; Jato-Espino *et al.,* 2014; Zavadskas *et al.,* 2016; Rinchen *et al.,* 2024). At the same time, evidence from Libya continues to characterise public construction delivery as exposed to persistent delay drivers and administrative constraints, which heighten the value of transparent and defensible decision processes (Tumi *et al.,* 2009; Salam & Gaith, 2020; Gebril, 2025).

Despite this relevance, existing research remains fragmented. Many studies focus on MCDM applications, others on leadership and learning in project outcomes, and others on digitalisation policy, leaving limited quantitative evidence that directly links organisational resources to MCDM adoption in public-sector construction organisations, and virtually none from the Libyan context (Tumi *et al.,* 2009; Salam & Gaith, 2020; Gebril, 2025). Moreover, government support is seldom modelled as a mediating mechanism between internal organisational resources and the adoption of analytical decision tools, even though theory implies that policy frameworks condition whether capabilities can be converted into routine practice. Few studies also operationalise transformational leadership, organisational learning, government support, and MCDM adoption simultaneously as reflective latent variables within a single structural model tailored to government construction sector.

This study addresses these gaps by developing and empirically testing a reflective measurement and structural model in Libyan government construction organisations, examining (1) the direct effects of organisational resources on MCDM adoption, (2) the direct effect of government support on MCDM adoption, and (3) the mediating role of government support between organisational resources and MCDM adoption. The relationships are represented in Figure 1.

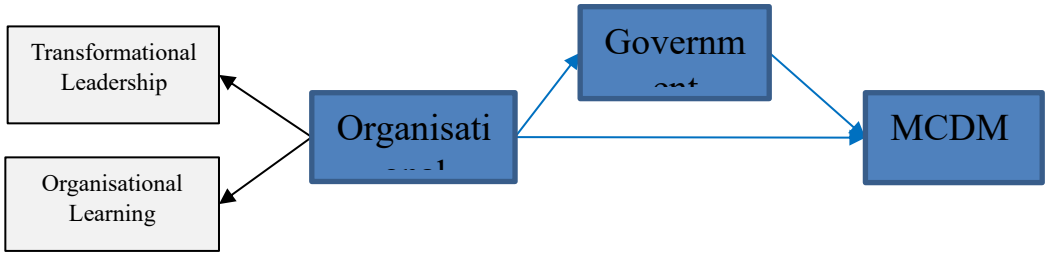

Figure 1. Conceptual Framework of the Study

2.10 Hypotheses

H1: Organisational Resources (Transformational Leadership and Organisational Learning) are positively associated with MCDM adoption in Libyan construction organisations.

H2: Government Support is positively associated with MCDM adoption in Libyan construction organisations.

H3: Government Support mediates the relationship between Organisational Resources and MCDM adoption such that the indirect effect is positive and significant.

3 Methodology

We estimated the proposed research model using partial least squares structural equation modelling (PLS-SEM) in SmartPLS 4. According to Hair, Hult, Ringle, and Sarstedt (2022), PLS-SEM is appropriate for prediction-oriented studies involving multiple latent variables, while Hair and Alamer (2022) further note its usefulness when the data may depart from multivariate normality. In line with these guidelines, we first assessed the reflective measurement models and then evaluated the structural model. As recommended by Hair *et al*. (2022), reliability and convergent validity were examined through indicator loadings, internal consistency measures, and the average variance extracted (AVE). Following Henseler, Ringle, and Sarstedt (2015), discriminant validity was evaluated using the heterotrait-monotrait ratio (HTMT). Where appropriate, consistent PLS (PLSc) was considered based on Dijkstra and Henseler (2015), and predictive performance was assessed using PLSpredict as suggested by Shmueli, Sarstedt, Hair, Cheah, Ting, Vaithilingam and Ringle (2019). The empirical context comprised public construction organisations operating in the western region of Libya. The unit of analysis was the construction organisations, while the unit of observation was one key informant selected from each construction organisation.

3.1 Questionnaire's scale

Survey attitudes were measured using a five-point Likert-type scale (1 = strongly disagree … 5 = strongly agree). Prior psychometric work indicates that response scales with roughly four to seven categories typically support reliable and valid measurement, whereas adding more categories often yields limited gains while increasing respondent burden (Likert, 1932; Sullivan & Artino, 2013; Preston & Colman, 2000; Lozano, García-Cueto & Muñiz, 2008; Aybek & Toraman, 2022). On this basis, a five-point format was treated as a pragmatic balance between clarity, discrimination, and respondent effort.

To mitigate risks associated with self-reported survey designs, we assured anonymity, used neutral wording, and separated predictor and outcome measures within the instrument. These procedural remedies aim to reduce social-desirability responding and common-method bias by creating psychological and temporal separation, consistent with established guidance in the common-method variance literature (Podsakoff, MacKenzie, Lee & Podsakoff, 2003; Podsakoff, MacKenzie & Podsakoff, 2024; Krumpal, 2013; Tourangeau & Yan, 2007; DeCastellarnau, 2018). Even with these steps, some residual method effects may remain possible in cross-sectional survey settings.

Table 1: Summary of Variables and Measurement of Indicators

Items	Variable & Dimensions	Scale	No. of questions
Organisational Resources	Transformational Leadership	5-points	5
	Organisational Learning	5-points	5
MCDM	MCDM	5-points	5
Government Support	Government Support	5-points	5

Table **2**: Sources of Measurement of Indicators

S/N	Variables	Sources	Remarks
1.	Government Support	Edler & Georghiou (2007); Zhu, Kraemer, & Xu (2006); Wang, Miao, Wang, (2023); Kim Lee, Yu & Son, (2022); Zuiderwijk & Janssen (2014); Mergel, Edelmann, & Haug (2019).	Adapted
2.	Organisational Resources	Transformational Leadership: Carless, Wearing & Mann (2000); Rafferty & Griffin (2004); Podsakoff, MacKenzie, Moorman & Fetter (1990). Organisational Learning: Jerez-Gómez, Céspedes-Lorente, & Valle-Cabrera (2005).	Adapted
3.	MCDM	Saaty (2008); Ishizaka & Labib (2011); Velasquez & Hester (2013); Durbach & Stewart (2012); Arroyo, Tommelein & Ballard (2016); Akter, Wamba, Gunasekaran, Dubey & Childe (2016); Popovič, Hackney, Coelho & Jaklič (2012).	Adapted

3.2 Sample size

An a priori power analysis in G*Power 3.1 was conducted using a medium effect size ($f^2 = 0.15$), $\alpha = .05$, and desired power = 0.90. For a model with two predictors, the minimum required sample is N = 88 (Cohen, 1977; Cohen, 1988; Gefen, Rigdon & Straub, 2011). To allow for nonresponse and data cleaning, we added a 30% buffer, setting the target at N = 115. This target is also consistent with practical guidance suggesting that many studies are adequately served by samples between 30 and 500, with larger sizes becoming more important as model complexity and measurement demands increase (Roscoe, 1975; Sekaran & Bougie, 2016).

4 Findings

4.1 Profile of the Firm and the Respondents

The demographic data of the respondents were analysed using descriptive frequency statistics with IBM SPSS (version 22). The data were collected from construction companies operating in Libya. Accordingly, employees of these construction organisations were selected as the survey respondents and were asked to answer all items in the questionnaire. Descriptive questions were also included to capture their views on Multi-Criteria Decision-Making practices among employees in Libyan construction organisations.

Out of the 115 questionnaires distributed, 97 were returned, resulting in a response rate of 84.3%. This relatively high response rate was largely due to the researcher's active efforts to ensure completion of the survey instruments. In particular, the procedures recommended by Frohlich (2002) for improving response rates were applied. These included notifying potential respondents in advance before sending out the questionnaire, which encouraged many participants to take part in the survey. In addition, reminder copies of the questionnaire were sent multiple times, each with a cover letter on the first page assuring potential respondents that their answers would be used strictly for academic purposes and handled with full confidentiality.

The demographic characteristics of the respondents and their organisations are summarised in Figures 2. The main personal characteristics of the company representatives who participated in the survey include their job position within the company, years of work experience, and gender. The organisational characteristic presented is workforce size, measured by the number of employees, as shown in Figures 2.

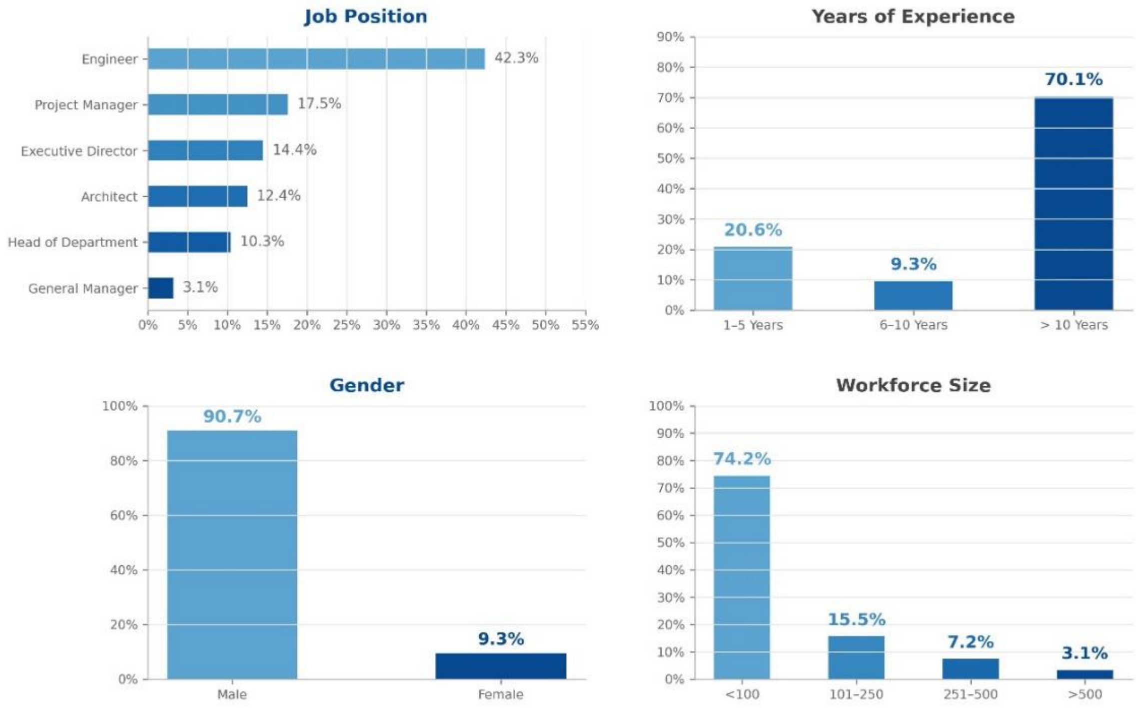

Figure 2. Demographic Profile of the Sampled Companies and their Respondents

4.2 Collinearity Statistics (VIF)

In addition to assessing collinearity at the higher-order construct level (Organisational Resources), variance inflation factor (VIF) diagnostics were also conducted at the dimension level. In this step, Government Support was modelled as an endogenous construct predicted by Transformational Leadership and Organisational Learning, while MCDM Adoption was

regressed simultaneously on TL, OL, and GS. This complementary analysis allows us to verify that the strong correlations between TL and OL, and their joint inclusion with GS, do not create problematic multicollinearity in the structural model. The dimension-level VIF results are summarised in Table 3.

Table 3: Collinearity assessment of the structural model (inner VIF values)

Endogenous construct	Predictor construct	VIF
Government Support	Transformation Leadership	2.42
Government Support	Organisational Learning	2.42
MCDM Adoption	Transformation Leadership	2.45
MCDM Adoption	Organisational Learning	2.94
MCDM Adoption	Government Support	1.74

As shown in Table 3, the VIF values for all predictor dimensions range between 1.74 and 2.94. These values are well below the commonly cited cut-off value of 5.0 for identifying harmful multicollinearity in regression and SEM applications (Hair, Hult, Ringle & Sarstedt, 2017) and also below more conservative thresholds of around 3.0–3.3 that have been recommended in the PLS-SEM literature when testing for full collinearity (Kock, 2015). In other words, the joint inclusion of TL and OL as predictors of GS, and of TL, OL, and GS as predictors of MCDM, does not generate problematic collinearity among the predictors. Consistent with these guidelines, the present results indicate that collinearity at the dimension level does not threaten the stability or interpretability of the estimated path coefficients, and the structural relationships can therefore be interpreted with confidence (Hair *et al.*, 2017; Kock, 2015).

4.3 Assessment of Measurement Model

The evaluation of the measurement model (outer model) includes assessing indicator (item) reliability, content validity, internal consistency reliability, convergent validity, and discriminant validity (Hair *et al.*, 2022; Fornell & Larcker, 1981).

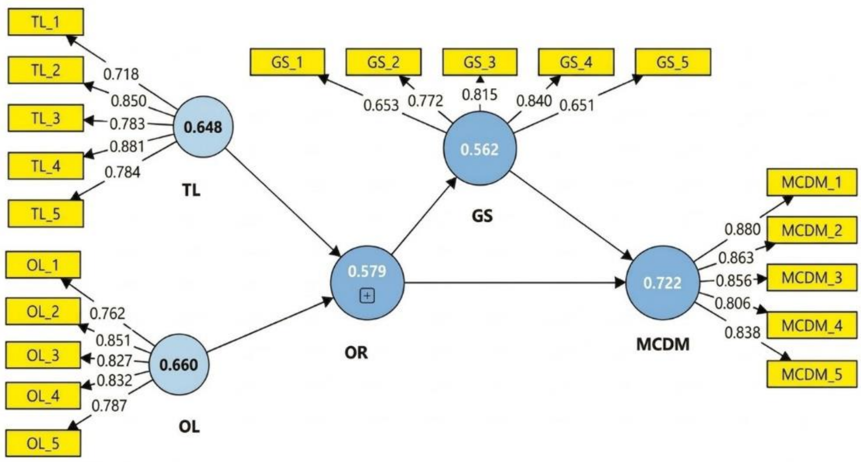

Figure 3. Evaluation of Measurement Model Through PLS Algorithm

4.4 Convergent Validity

Convergent validity of the reflective measurement model was assessed by examining the standardised factor loadings, Cronbach's alpha (α), composite reliability (CR), and average variance extracted (AVE) for the four constructs: Government Support, Transformational Leadership, Organisational Learning, and MCDM Adoption. PLS-SEM guidelines recommend loadings ≥ 0.70 (with 0.40 - 0.70 acceptable when CR and AVE remain adequate and the item is theoretically justified) and reliability indices (α, CR) ≥ 0.70 and AVE ≥ 0.50 (Fornell & Larcker, 1981; Hair, Hult, Ringle & Sarstedt, 2014; Hair *et al.*, 2017; Cheung, Cooper-Thomas,

Lau & Wang, 2024). Table 4 reports the standardised loadings together with α, rho_A, CR, and AVE for each construct.

Table 4: Construct Reliability and Validity

Items	Loading	Cronbach's Alpha	Rho_A	CR	AVE
GS	0.651 - 0.840	0.800	0.832	0.864	0.562
TL	0.718 - 0.881	0.862	0.882	0.902	0.648
OL	0.762 - 0.832	0.870	0.888	0.906	0.660
MCDM	0.806 - 0.880	0.899	0.914	0.928	0.722

Note; (G.S.) Government Support, (T.L.) Transformational Leadership, (O. L.)
Organisational Learning, (M.C.D.M.) Multi-Criteria Decision-Making.

The results in Table 4 show that the standardised loadings range from 0.651 to 0.881, indicating that all items share substantial variance with their constructs. Although GS1 and GS5 fall slightly below the 0.70 guideline (0.653 and 0.651), they remain above 0.65 and are supported by acceptable construct-level indices for GS (α = 0.800, CR = 0.864, AVE = 0.562), confirming its convergent validity (Fornell & Larcker, 1981; Hair *et al.*, 2014; Hair *et al.*, 2017; Cheung *et al.*, 2024). The other constructs (TL, OL, MCDM) show even stronger psychometric properties, with α and CR > 0.80 and AVE between 0.648 and 0.722, so convergent validity is adequately established for all reflective constructs and no item requires removal; GS1 and GS5 are retained to preserve the content coverage of Government Support.

4.5 Discriminant Validity

Discriminant validity was assessed using the Fornell and Larcker criterion, which requires that the square root of a construct's AVE (diagonal elements) is greater than its correlations with other constructs (off-diagonal elements) (Fornell & Larcker, 1981; Hair *et al.*, 2017). Table 5 reports this matrix for Government Support, Transformational Leadership, Organisational Learning, and MCDM Adoption. Table 5: Discriminant validity results based on Fornell and Larcker criterion.

Table 5: Fornell and Larcker discriminant validity matrix

Items	GS	TL	OL	MCDM
GS	0.750			
TL	0.551	0.805		
OL	0.647	0.766	0.812	
MCDM	0.593	0.271	0.436	0.849

Note; (G.S.) Government Support, (T.L.) Transformational Leadership,
(O. L.) Organisational Learning, (M.C.D.M.) Multi-Criteria Decision-Making.

As shown in Table 5, the square root of AVE for each construct (diagonal values) is higher than its correlations with the remaining constructs in the same row and column. This pattern satisfies the Fornell and Larcker criterion and indicates adequate discriminant validity (Fornell & Larcker, 1981; Hair *et al.*, 2017). In addition, all HTMT values were below 0.90, which further confirms that the constructs are empirically distinct (Henseler *et al.*, 2015).

4.6 Assessment of Significance of the Structural Model

The significance of the structural relationships was evaluated using the standardised path coefficients (β), t-values, and p-values for the effects of Organisational Resources and Government Support on MCDM Adoption**.** Following established PLS-SEM guidelines, path coefficients are considered significant when $p < 0.05$ (Fornell & Larcker, 1981; Hair *et al.,* 2017). Table 6 summarises the direct effects examined in the structural model. Table 6 depicts the inner model with the inclusion of the mediating role of Government Support between Organisational Resources and MCDM adoption.

Table 6: Results of Bootstrapping for Structural Model Evaluation

Variables	Beta (ß)	T-Value	P-Value	Findings
OR -> GS	0.635	9.45	0.000	Supported **
GS -> MCDM	0.592	5.74	0.000	Supported **
OR -> MCDM	-0.004	-0.04	0.957	Not Supported
OR -> GS-> MCDM	0.375	5.18	0.000	Supported **

Note: **Significant at 0.05 (p-value), Note; (G.S.) Government Support, (O.R.) Organisational Resources, (M.C.D.M.) Multi-Criteria Decision-Making.

H1: Organisational Resources do not exert a statistically significant direct effect on MCDM adoption.

H2: Government Support exerts a positive and statistically significant direct effect on MCDM adoption.

H3: Government Support mediates the relationship between Organisational Resources and MCDM adoption, such that OR exert a positive and statistically significant indirect effect on MCDM adoption through GS.

4.7 Effective Size and Predictive Relevance

The explanatory power of the structural model was assessed using the coefficient of determination (R^2) for the endogenous construct. In PLS-SEM, R^2 values of approximately 0.25, 0.50 and 0.75 are considered weak, moderate, and substantial respectively (Hair *et al.,* 2017; Cohen, 1988). Table 7 presents the R^2 value for MCDM Adoption.

Table 7: Variance Explained in the Endogenous Latent Variable

Latent Variable	**Variance Explained (R^2)**
Multi-Criteria Decision-Making Adoption	0.372

An R^2 value of 0.372 indicates that the model explains 37.2% of the variance in MCDM adoption, which can be regarded as an acceptable level of explanatory power in the context of behavioural and organisational research (Hair *et al.,* 2017; Cohen, 1988). In addition, the cross-validated redundancy (Q^2) for MCDM (not tabulated) was positive, indicating that the structural model also possesses acceptable predictive relevance according to the Stone-Geisser criterion (Geisser, 1975; Stone, 1974).

4.8 Test of The Mediating Effect

The mediating role of Government Support in the relationship between Organisational Resources and MCDM adoption was examined using the bootstrapping procedure within the PLS-SEM framework. The analysis showed that OR has a positive and significant effect on GS, and GS in turn has a positive and significant effect on MCDM adoption. However, when GS was included in the model, the direct effect of OR on MCDM became statistically non-significant. In contrast, the indirect effect (OR → GS → MCDM) was positive and statistically significant, as indicated by its bootstrapped t-value and p-value. These results collectively demonstrate a full mediation effect, meaning that Organisational Resources contribute to the adoption of multi-criteria decision-making primarily indirectly, through strengthening Government Support rather than through a direct pathway.

5 Discussion

The structural results address the study's core question regarding how internal organisational conditions and external institutional support jointly relate to MCDM adoption in Libyan public construction sector. Specifically, organisational resources show a strong positive effect on perceived government support, while government support, in turn, exhibits a substantial positive effect on MCDM adoption. By contrast, the direct path from organisational resources to MCDM adoption is statistically non-significant. Taken together, this pattern is consistent with full mediation and provides acceptable explanatory power for MCDM adoption, suggesting that internal capabilities operate primarily through the institutional channel rather than translating directly into the routine use of formal decision-making tools.

This configuration aligns with the theoretical logic that resources and capabilities yield outcomes through mechanisms that fit the operating environment. Barney (1991) conceptualises organisational resources as valuable, rare, inimitable, and non-substitutable assets that can underpin sustained performance advantages, while Teece (2007) and Crossan et al. (1999) emphasise dynamic capabilities and organisational learning as processes through which construction organisations sense, seize, and reconfigure in response to environmental turbulence. Likewise, Azizi (2017) indicates that organisational learning capability can strengthen the impact of strategic initiatives on sustainable performance, implying that learning routines help channel resources into concrete outcomes rather than leaving them as latent potential. Read against this backdrop, the strong positive effect of organisational resources on government support in this study suggests that transformational leadership and learning-oriented cultures may help public construction sector interpret external programmes as opportunities, align with policy agendas, and engage more proactively with ministries and agencies, thereby increasing the likelihood that support is perceived as accessible and actionable.

The leadership component is consistent with the way transformational leadership is theorised to enable change under constraint. Bass and Avolio (1994) describe transformational leadership as comprising idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration, all of which can elevate followers' commitment and openness to change. In construction-sector settings, Ofori (2008) argues that such leadership is critical for industry development in emerging economies. Empirical studies also link transformational leadership to project success and show that leadership qualities shape outcomes in project environments (Ofori, 2008; Liphadzi et al., 2015; Garcés, 2020). The present findings extend this stream by indicating that, in Libyan public construction organisations, transformational leadership and organisational learning appear to enhance MCDM adoption mainly indirectly, insofar as they strengthen the perceived and actual support provided by government bodies, rather than exerting a statistically detectable direct effect on MCDM adoption.

The institutional pathway is also coherent with the nature of MCDM and the conditions typically required for its routinisation. Prior work establishes that MCDM methods are central

tools for handling complex trade-offs in construction and civil engineering and can support sustainability-oriented choices when criteria and stakeholder judgements are structured and made traceable (Jato-Espino et al., 2014; Zavadskas et al., 2016; Erdoğan et al., 2019). At the same time, arguments for data-driven decision-making emphasise that superior outcomes are more likely when analytical routines are embedded rather than used sporadically, and when organisations develop the capabilities to rely on evidence rather than intuition alone (McAfee & Brynjolfsson, 2012; Chatterjee et al., 2023). Against this background, the strong link between government support and MCDM adoption observed here suggests that Libyan public sector organisations are more likely to institutionalise MCDM when policy frameworks, standards, and training programmes explicitly encourage or require such practices. This interpretation is consistent with evidence that government engagement, regulation, and incentives are decisive for digital and analytical transformation in construction organisations in developing countries (Rinchen et al., 2024; Tanoli, 2025).

Finally, when situated within Libya's documented delivery constraints, including chronic delays, weak planning, and related administrative and financing frictions, the mediation pattern has a clear implication for how capability translates into practice. The evidence of persistent problems in Libyan public projects (Tumi et al., 2009; Salam & Gaith, 2020; Gebril, 2025) provides a plausible context in which organisational resources alone may be insufficient to drive the systematic adoption of formal analytical tools. In such settings, the full mediation pattern indicates that capable leadership and learning are likely necessary but not sufficient. Without robust government support, organisational resources do not translate into consistent MCDM use in Libya's public construction sector (Tumi et al., 2009; Salam & Gaith, 2020; Gebril, 2025).

6 Research Implications

The findings refine resource-based and dynamic-capabilities perspectives by suggesting that, in state-dominated construction organisations, organisational resources influence outcomes largely through their effect on external institutional conditions rather than solely through internally driven changes in routines (Barney, 1991; Teece, 2007). More specifically, leadership and organisational learning appear to matter not only because they improve internal processes, but also because they help organisations interpret, navigate, and respond to the policy environment in which public construction decisions are made.

These findings also extend Crossan *et al.*'s (1999) framework and Azizi's (2017) work on organisational learning by indicating that learning-oriented practices in public sector can help managers recognise the practical relevance of government programmes and mobilise them as enabling conditions for MCDM adoption. In this way, government support emerges as a key explanatory mechanism through which transformational leadership and organisational learning shape analytical decision-making, rather than as a background institutional condition operating independently of firm-level capabilities.

For MCDM and construction-management research, the results extend prior work that has largely emphasised technical applications of MCDM by articulating an organisational-level adoption model in which institutional mediation is explicit (Jato-Espino *et al.*, 2014; Zavadskas *et al.*, 2016; Erdoğan *et al.*, 2019). The evidence further suggests that analytical-tool adoption models in public construction may benefit from conceptualising government support as an endogenous construct that can be strengthened or weakened by organisational capabilities, not only as an exogenous contextual factor.

Practically, the results imply that senior managers in Libyan public construction organisations should focus on building the internal conditions that make engagement with government initiatives feasible and sustained. In particular, investment in transformational-leadership development and organisational-learning routines may increase readiness to participate in digital and decision-support programmes and to integrate structured decision approaches into

managerial work (Bass & Avolio, 1994; Ofori, 2008; Liphadzi *et al.*, 2015). However, the findings also imply a clear constraint: without parallel reforms on the government side such as clear mandates for MCDM use in procurement, standardised templates, training, and enabling digital platforms internal capability building is unlikely to translate into systematic MCDM adoption at scale (Rinchen *et al.*, 2024; Tanoli, 2025). For policymakers, the study therefore highlights that strengthening leadership and learning inside public construction organisations and designing coherent government-support programmes should be treated as complementary levers for embedding more transparent, evidence-based MCDM practices in Libya's public construction sector.

7 Limitations and Paths for Future Research

Several limitations should be acknowledged. First, the study employed a cross-sectional survey design, which restricts firm causal inference and does not allow the temporal ordering among organisational resources, government support, and MCDM adoption to be established with certainty. Future research could adopt longitudinal designs to examine how these relationships evolve over time.

Second, the empirical setting was limited to public construction organisations in the western region of Libya. As institutional and operational conditions may vary across regions and across construction organisations, the findings should be generalized with caution. Future studies could test the model in other Libyan regions and in private or international construction contexts to assess its broader applicability.

Third, the study relied on a single key informant from each firm. Although this approach is suitable for obtaining firm-level information, it may still introduce informant-specific bias. Future research could improve robustness by collecting data from multiple respondents within each organisation.

Fourth, the model examined only one mediating mechanism, namely government support. Other contextual and organisational factors, such as digital readiness, organisational structure, and supply chain integration, may also shape MCDM adoption. Future studies could extend the model by incorporating these additional variables as mediators or moderators.

Finally, the quantitative design provides limited insight into how MCDM adoption is enacted in practice. Qualitative or mixed-methods research could therefore complement the present findings by offering a deeper understanding of how organisational resources and government support influence decision-making processes in construction organisations.

8 Conclusions

This study examined how organisational resources and government support jointly shape the adoption of MCDM practices in Libyan public construction organisations. The results indicate that transformational leadership and organisational learning are positively associated with perceived government support, which in turn is linked to greater readiness to use MCDM, whereas the direct relationship between organisational resources and MCDM adoption appears negligible. Taken together, the evidence suggests that internal capabilities are most consequential insofar as they enable public construction organisations to engage with, interpret, and leverage external policy frameworks, programmes, and digital platforms that make analytical decision routines both feasible and legitimate.

The findings also highlight an important practical implication. Strengthening analytical decision-making in Libya's public construction sector is unlikely to depend on a single lever. Rather, it appears to require a dual strategy in which public construction organisations cultivate leadership and learning-oriented cultures that support structured analysis, while government agencies provide the mandates, standards, training, and technological support needed to institutionalise MCDM in procurement and project decision-making processes. Addressing both dimensions in tandem may offer a more realistic basis for embedding transparent and evidence-based resource allocation in public construction.

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