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Strategic Planning Behaviors and Their Effects on Public Construction Management Performance

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Abstract

Effective planning behaviors are critical to the success of public construction investment, particularly within institutional environments marked by regulatory complexity and fiscal constraints, yet prior research has largely overlooked the specific functional behaviors involved in planning processes for public sector infrastructure development. This study conceptualizes planning behaviors as a multidimensional construct and empirically examines their impact on management performance, identifying eight behavioral dimensions—ranging from guideline dissemination to capital allocation and project selection—through a survey of 136 experienced public sector professionals analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings reveal that Capital Allocation Planning (PL5) and Project Selection (PL6) significantly and positively influence management performance, while Capacity of Investment Balance (PL7) has a significant but negative effect; other behaviors, such as Planning Guidelines (PL1), Plan Consistency (PL4), and Execution Descriptions (PL8), lack direct effects but play crucial mediating roles through PL5 and PL6. These results highlight the differentiated impact of planning actions, emphasizing the need for a multi-level behavioral framework to enhance planning effectiveness, improve managerial practices, reform policies, and advance theoretical understanding of infrastructure governance in public investment.

1. Introduction

Over the years, a substantial body of research has emphasized the role of management behaviors as a key determinant of effective construction investment. These studies have highlighted how team management behaviors—such as coordination, empowerment, and commitment—contribute to successful project delivery in conventional construction settings [26, 35]. While this body of work has deepened understanding of project success factors, it largely concentrates on generalized team dynamics or broad human resource practices [41, 50], with limited emphasis on specific, functional managerial behaviors such as planning.

Existing research also tends to focus on traditional construction organizations operating under consultant-contract frameworks, where owners, consultants, and contractors assume clearly delineated responsibilities [37,

48]. These contexts differ significantly from public construction investment environments, which involve multiple government stakeholders, regulatory constraints, and policy-driven priorities that complicate behavioral dynamics [25, 28]. Despite efforts to adapt behavioral management concepts from general or private-sector contexts, such adaptations often fail to capture the complexity, procedural rigidity, and performance accountability specific to public investment management [14, 29].

Moreover, most existing models adopt a generalized or top-down view of behavioral influence without sufficiently interrogating the nuanced behavioral expressions within specific management functions—especially planning. While some progress has been made in recognizing the influence of managerial functions such as scheduling or budgeting [36, 37], these studies have not systematically addressed how individual planning behaviors contribute to management performance in the unique institutional setting of public construction.

This presents a critical gap: existing frameworks offer limited granularity and fail to reflect the reality that in public investment, planning behaviors are not only foundational but also tightly interwoven with regulatory, fiscal, and procedural mandates [12, 49]. The lack of empirical operationalization of specific planning behaviors limits the utility of existing theories in guiding practice or informing performance improvement in public construction investment.

This study, therefore, does not begin with a predetermined model but rather builds inductively upon a critical review of existing limitations. Through this process, we identify overlooked aspects of planning behavior and conceptualize a framework more attuned to the needs of public-sector construction management. Specifically, this study aims to examine the attributes of planning behavior and evaluate their effects on management performance in public construction projects.

For academics, this research contributes a more context-sensitive behavioral model and addresses conceptual gaps in the adaptation of private-sector theories to public investment environments. For practitioners, it provides actionable insights to support effective planning behaviors within the institutional constraints of government-led construction programs.

The remainder of this paper is structured as follows: Section 2 outlines the theoretical background and hypothesis development. Section 3 details the research methodology. Section 4 presents findings, discussion, and implications. Section 5 concludes with limitations, and future research directions.

2. Theoretical Background and Hypothesis Development

2.1 Planning Behaviors in Public Construction Investment: A Contextual and Functional Perspective

Planning is a fundamental managerial function through which goals are set and strategies are developed to achieve those goals. According to Tripathi and Reddy [46], planning entails establishing objectives, formulating actions to reach those objectives, assigning responsibilities, monitoring progress by comparing actual outcomes with intended targets, and making necessary adjustments to ensure goal attainment. Similarly, Williamset al. [49] emphasizes that planning involves both goal determination and the design of appropriate strategies, highlighting its dual nature as both a conceptual and operational activity.

In the context of public construction investment, planning serves as a structured mechanism that ensures stakeholders understand both what needs to be done and how it should be executed within defined timelines and resource constraints. Thus, developing planning behaviors become essential, as it directly influences the clarity, consistency, and effectiveness of decision-making processes throughout the project lifecycle.

Planning behaviors, viewed through the lens of organizational management, reflect a deliberate effort to coordinate individuals and teams toward shared objectives. Kreitner and Kinicki [31] define this behavior as the function that aligns organizational efforts through purposeful coordination. It fosters a collective orientation where roles and responsibilities are clearly defined and progress is continually monitored and adapted. Moreover, effective planning behaviors are closely tied to interpersonal dynamics and organizational culture. As Walker [47] argues, the success of any organization hinges on how effectively its members collaborate, while Robbinset al. [44] collectively underscore that employee behavior significantly influences organizational performance. This suggests that beyond technical planning tools, the behavioral dimensions of planning—such as commitment, communication, and adaptability—are critical in shaping outcomes, particularly in complex and resource-intensive domains like public infrastructure investment.

The process of formulating public investment capital plans is closely tied to the broader development of public investment strategies within the infrastructure sector. Thus, understanding how capital planning functions in practice necessitates a deep understanding of how public investment plans are formed and implemented at the sectoral level. Public investment planning is classified across several dimensions: by duration (e.g., five-year medium-term plans vs. annual implementation plans), by administrative level (e.g., national, ministerial, or local authority), and by funding source (e.g., central budget, local budget, or revenue-generating public units).

In this study, planning behaviors are analyzed through the lens of both medium-term and annual public investment plans, within projects and programs led by a central implementing agency. Drawing on general

principles of management science, planning is defined as a systematic process through which goals are set, action plans are formulated to achieve those goals, responsibilities are assigned, and performance indicators are monitored and revised [15]. Planning provides a directional guide for organizations by clarifying strategic priorities and outlining how objectives will be achieved [1, 5]. As the first step in any management cycle, effective planning ensures that all stakeholders understand their roles and responsibilities in achieving shared goals.

Similar to general organizational planning, investment planning involves establishing a structured set of actions, detailing what tasks are to be done, the timeline for execution, and how resources will be allocated to achieve the desired investment outcomes [10]. Investment planning is therefore a critical success factor in all capital-intensive activities. It enables stakeholders to comprehend project scope, responsibilities, and performance expectations aligned with overall development goals [1, 5].

To conceptualize planning behaviors within public investment management, measurement indicators must be derived from management science principles [16]. Accordingly, planning behaviors are operationalized through concrete managerial practices in the public construction domain. These include goal-setting, action planning, responsibility assignment, and the review and refinement of investment plan [12, 16, 17]. As such, the planning behavior construct in this study reflects real-world practices of managing public capital in infrastructure projects.

Goal setting is a fundamental aspect of all planning activity. Defining clear, actionable objectives allows project stakeholders to formulate aligned strategies and implementation steps [13]. The overarching goal of public investment capital planning is to satisfy infrastructure development needs within approved budgets, on schedule, and in accordance with legal and policy frameworks [7, 11]. Given the inter-agency nature of public projects, uniformity in understanding and applying planning guidelines among stakeholders is essential (PL1).

In practice, Vietnam's medium-term capital plans span five years and are aligned with the national socioeconomic development strategy and budget framework. Annual investment plans serve to operationalize these medium-term visions and must align with national financial and debt strategies (PL2). Moreover, these plans must be realistic, reflecting macroeconomic constraints, limited state budget resources, and the necessity to mobilize private sector capital (PL3). Empirical research has shown that action plans disconnected from broader strategic goals often result in project delays and failure [2]. Therefore, annual capital plans must be consistent with pre-approved medium-term frameworks (PL4).

Given constrained financial resources, investment plans must also adhere to criteria for capital allocation established by competent authorities to ensure equity and effectiveness across regions and sectors (PL5). With rising infrastructure demands, particularly in the transport sector, capital planning must incorporate a prioritization mechanism that aligns funding allocation with national development goals, debt safety, and resource mobilization potential [33] (PL6).

The formulation of capital investment plans is closely intertwined with the project initiation process. A project's feasibility must be assessed based on clearly defined objectives, scope, implementation actions, phased timelines, stakeholder relationships, and financing arrangements [3, 4, 6, 9]. To ensure implementation success, action plans must be simple yet detailed enough to be executable and reviewable. Decision-makers must also consider the availability of public resources and potential for attracting alternative capital, in line with debt servicing capabilities (PL7).

Finally, operationalizing these plans requires a comprehensive set of implementation strategies—such as funding mobilization schedules, capital disbursement phases, and budget balancing measures—all tailored to support the stated investment objectives. These strategic actions form the operational core of medium-term and annual public construction investment plans [30](PL8).

In summary, eight distinct behavioral dimensions were identified and synthesized to form the conceptual framework of planning behaviors, which serves as the basis for hypothesis testing within the context of public construction investment (see Table 1).

Table 1 *Conceptual framework of planning behaviors*

Code	Behavioral dimensions	Descriptions	References
PL1	Planning Guidelines	The extent to which guidelines on the formulation of medium-term and annual public investment plans are fully and clearly disseminated to relevant departments and stakeholders.	[7, 11, 13]
PL2	Planning Alignment	The degree of alignment between the medium-term and annual public investment plans and the approved sectoral development goals, sectoral master plans, financial plans, and the medium-term public debt borrowing and repayment plan.	[32, 38]
PL3	Demand and Capacity Balance	The degree of alignment between the public investment plan and the capacity to balance public investment resources and mobilize investment capital from other economic sectors.	[32, 38]
PL4	Investment Plan Consistency	The degree of consistency between the annual public investment plan and the approved medium-term public investment plan for construction projects	[2]
PL5	Capital Allocation Plan	The appropriateness of the capital allocation plan in accordance with the principles, criteria, and norms for public investment capital allocation approved by competent authorities for each planning period.	[33, 39]
PL6	Project Selection	The extent to which the prioritization, project selection, and specific capital allocation for each project in the medium term align with the capacity to balance public investment resources and mobilize other funding sources to achieve the objectives, tasks, and orientations of the socio-economic development plan.	[33]
PL7	Capacity of Investment Balance	The extent to which investment policy decisions for projects are aligned with the capacity to balance public investment resources and mobilize additional funding sources for programs and projects financed through multiple sources, as well as with the government's borrowing and debt repayment capacity.	[3, 4, 6, 9]
PL8	Description of Plan Execution	The clarity and specificity in the description of implementation measures, organizational arrangements, and anticipated outcomes of the medium-term and annual public investment plans for construction.	[30]

As articulated in the study, the behavioral dimensions described are explicitly designed as observed variables, not latent constructs. Specifically, dimensions such as planning behavior are directly measured and thus constitute observed variables within our model framework. Following the guidance of Diamantopouloset al. [21] and Bergkvist and Rossiter [18], this study has employed single-item measures for these doubly concrete constructs, as they are theoretically and empirically justified in this context. This approach aligns with established practices for single-item measurement when constructs are concrete and directly observable, as further supported by similar applications in Nguyen [38].

2.2 Hypotheses

Management performance refers to the outcomes or achievements resulting from a task or a process of implementation. These outcomes are typically the result of one or more preceding causal factors and are evaluated in relation to those factors. In the context of public investment management, particularly in transport infrastructure, performance is conventionally assessed through three core dimensions: quality, schedule, and cost [20, 40]. These criteria are widely recognized in both project management literature and public sector evaluation frameworks as fundamental to assessing the effectiveness of management processes.

However, in public sector contexts, performance evaluation must also consider the broader legal and administrative frameworks that govern public investment. For instance, in Vietnam, the Law on Public Investment mandates that investment plan implementation must: (i) align with objectives approved by competent authorities; (ii) adhere to allocated capital plans and implementation schedules; and (iii) demonstrate effectiveness in mobilizing additional resources and contributing to national socio-economic development. Accordingly, this study operationalizes management performance across four key indicators: quality (MP1), schedule (MP2), cost (MP3), and compliance with investment policy and socio-economic impact expectations (MP4).

Public construction investment planning is markedly different from typical business or organizational planning. It is embedded within a complex system of government expenditure that operates across long-term, medium-term, and annual cycles. This planning not only supports government operations but also facilitates broader economic development [22]. The complexity of public investment planning stems from its interdependence with fiscal constraints, institutional regulations, and multi-stakeholder interests. Moreover, public investment—particularly when inefficient—can increase the risk of unsustainable debt levels, which in turn poses significant challenges to macroeconomic stability [19, 23].

In such a constrained and regulated environment, effective planning behaviors become essential. Planning behaviors refer to the deliberate actions, routines, and mechanisms through which investment plans are formulated, aligned, and executed to achieve common goals. This involves complying with legal standards, balancing investment demand with available capacity, ensuring inter-agency alignment, and maintaining consistency and transparency throughout the planning cycle. It is posited that well-developed planning behaviors positively influence the performance of public construction investment management by enhancing implementation effectiveness, improving resource use efficiency, and reducing execution risks.

Based on this theoretical foundation, the following hypotheses are proposed to examine the relationship between key planning behaviors and management performance in public construction investment (Fig 1):

- *Hypothesis 1 (H1): Planning Guidelines have a positive influence on the management performance of public construction investment.*
- *Hypothesis 2 (H2): Planning Alignment has a positive influence on the management performance of public construction investment.*
- *Hypothesis 3 (H3): Demand and Capacity Balance has a positive influence on the management performance of public construction investment.*
- *Hypothesis 4 (H4): Investment Plan Consistency has a positive influence on the management performance of public construction investment.*
- *Hypothesis 5 (H5): Capital Allocation Planning has a positive influence on the management performance of public construction investment.*
- *Hypothesis 6 (H6): Project Selection has a positive influence on the management performance of public construction investment.*
- *Hypothesis 7 (H7): Capacity of Investment Balance has a positive influence on the management performance of public construction investment.*
- *Hypothesis 8 (H8): Plan Execution Description has a positive influence on the management performance of public construction investment.*

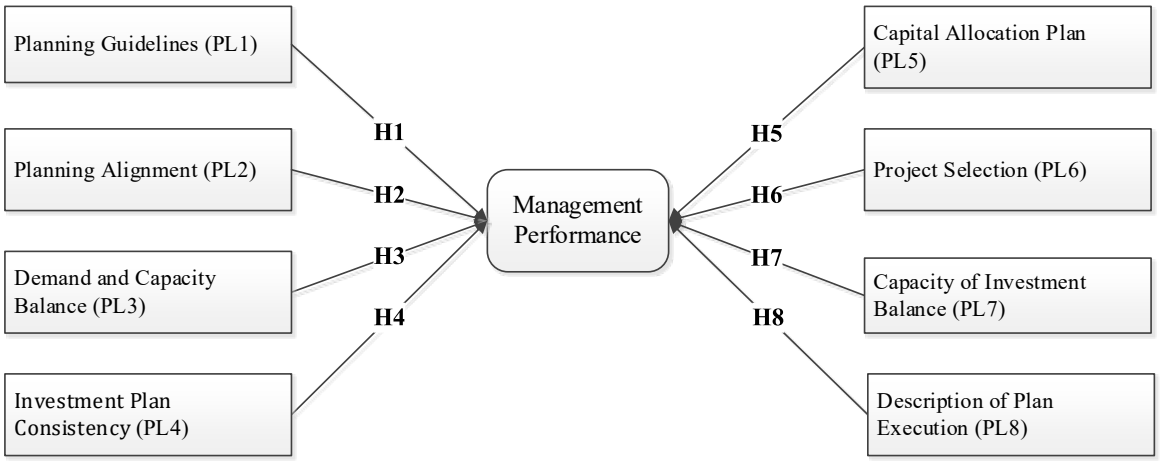

Fig. 1 *Conceptual framework of planning behaviour's effects*

3. Material and Methods

3.1 Data Collection

To empirically examine the hypothesized relationships between planning behaviors and management performance in public construction investment, a structured survey-based approach was employed. Given the study's focus on behavioral dimensions rooted in planning functions within the public sector, a pilot study was first conducted to refine the instrument. This pilot involved 15 experienced professionals, comprising five managers, five auditors, and five clients, selected to reflect the diversity of roles involved in public construction planning and oversight. The pilot assessed item clarity, relevance, and response feasibility, with revisions made to enhance interpretability and reduce technical ambiguity.

The finalized questionnaire was distributed via an online platform to 219 public sector professionals involved in construction investment across Vietnam. Participants were selected based on their recent involvement in planning and managing public construction projects. After excluding incomplete responses, 136 valid responses were retained for analysis (Table 2). Of these, 74 were from officials in public project management units, 29 from planning departments in public offices, and 33 from state capital management units. Notably, 75% of respondents had over a decade of experience in the sector, and all held at least a bachelor's degree, ensuring the expertise required for valid and informed responses.

Table 2 *Demographic characteristics of respondents (N = 136)*

Variables	Category	Frequency (n)	Percentage (%)
Gender	Male	92	67.6%
	Female	44	32.4%
Position	Public Project Management Officer	74	54.4%
	Government Planning Officer	29	21.3%
	State Capital Management Officer	33	25.0%
Years of Experience	Less than 5 years	18	13.3%
	5–10 years	15	11.0%
	More than 10 years	103	75.7%
Educational Level	Bachelor's degree	68	50.0%
	Master's degree	55	40.4%
	Doctorate	13	9.6%

To ensure the validity and applicability of the study's conclusions, particular attention was paid to the representativeness of the sample. The final dataset included 136 valid responses from experienced professionals across three key functional roles in public construction investment: public project management officers (54.4%), government planning officers (21.3%), and state capital management officers (25.0%). This distribution reflects the actual administrative structure and task allocation in Vietnam's public investment system, where planning, implementation, and capital oversight functions are institutionally distinct but operationally interdependent.

Importantly, the sample was highly experienced, with over 75% of respondents having more than 10 years of professional involvement in public investment projects. This enhances the reliability of responses by ensuring that participants possessed both the technical expertise and institutional familiarity required to evaluate nuanced planning behaviors and their effects on performance. Additionally, all respondents held at least a bachelor's degree, with over 50% holding a master's or doctoral degree, further supporting the informed nature of the data.

Geographically and institutionally, the sample captured perspectives from central government agencies and decentralized units involved in transport infrastructure—a sector that constitutes a significant portion of Vietnam's capital expenditure. While the use of a purposive sampling strategy may limit statistical generalization, the theoretical generalizability is strengthened by the sectoral and institutional alignment of the respondents with the research context.

3.2 Measurement

The survey was designed to align directly with the conceptual framework developed in Section 2. The instrument comprised two main sections: (1) demographic and experiential information of respondents, and (2) measurement of planning behavior constructs and management performance indicators. Planning behaviors were operationalized using eight dimensions identified through prior theoretical elaboration (e.g., Planning Guidelines, Alignment, Resource Balance, Plan Consistency), with each construct measured using multiple items rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

To evaluate the validity and reliability of these constructs, Confirmatory Factor Analysis (CFA) was conducted. CFA assessed the structural soundness of the measurement model and verified that each item loaded significantly onto its corresponding latent construct. Subsequently, Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed to test the hypothesized relationships. This approach was deemed appropriate due to the moderate sample size and the exploratory nature of the behavioral relationships being modeled. Compared to covariance-based SEM, PLS-SEM allows for greater flexibility in modeling complex constructs with fewer distributional assumptions [27].

The analysis proceeded in two stages. First, the measurement model was tested for internal consistency, convergent validity, and discriminant validity. Second, the structural model was assessed to estimate the direct and indirect effects of planning behavior constructs on management performance. The path coefficients and significance levels were derived using bootstrapping with 5,000 resamples, ensuring robust estimation of standard errors and confidence intervals.

Through this methodological framework, the study rigorously examined the empirical validity of the proposed planning behavior model and its influence on management effectiveness in public construction investment.

Given the reliance on self-reported data collected from a single group of respondents, steps were taken to mitigate the potential impact of common method bias (CMB), which can arise when both predictor and outcome variables are sourced from the same instrument. In line with established recommendations [42], several procedural remedies were implemented to reduce this risk.

First, respondents were explicitly assured of anonymity and confidentiality during data collection. This was done to minimize social desirability bias and evaluation apprehension, thus encouraging honest and unbiased responses.

Second, the questionnaire was deliberately structured to psychologically and visually separate the sections measuring independent planning behavior variables and those assessing dependent performance outcomes. This separation helped reduce priming effects and respondent tendencies to infer causal relationships.

Third, a pilot test was conducted with a diverse group of practitioners to evaluate item clarity, relevance, and cognitive load. Feedback from this pilot study enabled the refinement and rewording of several items, thereby minimizing ambiguity and reducing the likelihood of measurement error attributable to respondent confusion.

Although these procedural measures are not foolproof, they align with best practices for reducing CMB in cross-sectional survey designs, and contribute to the internal validity of the study's findings.

4. Results and Discussion

4.1 Empirical Findings

The structural relationships between dimensions of planning behavior and management performance in public construction investment were examined using Partial Least Squares Structural Equation Modeling (PLS-SEM). This method is well-suited for exploratory research and is effective with small to medium sample sizes [27]. To evaluate the statistical significance of the path coefficients, a bootstrapping procedure with 5,000 subsamples was conducted. In the initial analysis, the indicator MP1 was removed due to an outer loading below the recommended threshold of 0.5 [8]. In the subsequent analysis, all remaining indicators demonstrated outer loadings exceeding the acceptable threshold, indicating satisfactory measurement reliability.

The results indicate that among the eight dimensions of planning behaviors, three variables exhibited statistically significant direct effects on management performance (MP) (Table 4):

- Capital Allocation Planning (PL5) demonstrated a positive and significant effect on MP ($\beta = 0.301$, $p < 0.05$),
- Project Selection (PL6) also had a positive and significant influence ($\beta = 0.236$, $p < 0.05$),
- Capacity of Investment Balance (PL7) showed a negative but significant relationship ($\beta = -0.166$, $p < 0.05$).

Together, these three constructs explain 39.3% of the variance in management performance ($R^2 = 0.393$), suggesting a moderate yet meaningful degree of explanatory power in the behavioral model. To assess the predictive relevance of the model, a blindfolding procedure was conducted. The Q^2 values for the endogenous constructs exceeded zero, indicating sufficient predictive relevance. Specifically, the Q^2 value for Management Performance was 0.221, suggesting medium predictive relevance [8].

By contrast, five other planning behaviors—Planning Guidelines (PL1), Planning Alignment (PL2), Demand and Capacity Balance (PL3), Investment Plan Consistency (PL4), and Description of Plan Execution (PL8)—did not demonstrate statistically significant direct effects on performance ($p > 0.05$). Nonetheless, these behaviors were found to exert indirect effects through their influence on PL5 and PL6 (Fig 2).

Specifically, PL1 significantly predicted PL5 ($\beta = 0.237$, $p < 0.05$) and PL6 ($\beta = 0.189$, $p < 0.05$); PL3 positively influenced both PL5 ($\beta = 0.232$, $p < 0.05$) and PL6 ($\beta = 0.157$, $p < 0.05$); and PL8 had strong effects on PL5 ($\beta = 0.434$, $p < 0.05$) and PL6 ($\beta = 0.529$, $p < 0.05$). Conversely, PL4 negatively influenced both PL5 ($\beta = -0.376$, $p < 0.05$) and PL6 ($\beta = -0.278$, $p < 0.05$). These results highlight a layered influence structure in which only select strategic planning behaviors directly affect outcomes, while others operate through mediating behavioral mechanisms.

4.2 Multicollinearity and Validity Diagnostics

To assess the robustness of the model and the quality of its measurements, standard diagnostics were conducted.

Multicollinearity was assessed through Variance Inflation Factor (VIF) values. All values ranged between 1.000 and 2.169, significantly below the recommended threshold of 10 [24], indicating no risk of multicollinearity and acceptable model specification.

Discriminant validity was evaluated using the Fornell–Larcker criterion (Table 3). The square root of the Average Variance Extracted (AVE) for each latent construct exceeded its highest correlation with any other construct, confirming satisfactory discriminant validity [24]. Together, these assessments validate the reliability and internal consistency of the measurement and structural models.

Table 3 *Comparison of square root of average variance extracted (AVE) and correlation coefficients between constructs*

			Latent constructs							
Latent constructs		AVE	PL7	PL5	PL3	PL8	PL4	PL2	PL1	PL6
Capacity of Investment Balance	PL7	1.000	1.000							
Capital Allocation Plan	PL5	1.000	0.085	1.000						
Demand and Capacity Balance	PL3	1.000	0.292	0.360	1.000					
Description of Plan Execution	PL8	1.000	0.320	0.432	0.429	1.000				
Investment Plan Consistency	PL4	1.000	0.281	-0.025	0.333	0.497	1.000			
Planning Alignment	PL2	1.000	0.328	0.028	0.317	0.299	0.319	1.000		
Planning Guidelines	PL1	1.000	0.062	0.367	0.289	0.362	0.248	0.261	1.000	
Project Selection	PL6	1.000	0.223	0.645	0.364	0.535	0.091	0.057	0.363	1.000

Table 4 *The results of hypotheses testing*

Hypotheses	Coef.	VIF	R square	R square adjusted	T Values	P Values	Interpretation
PL1 → MP	0.139	1.363	0.429	0.393	1.411	0.157	Not supported
PL2 → MP	0.037	1.337			0.417	0.676	Not supported
PL3 → MP	0.023	1.468			0.243	0.807	Not supported
PL4 → MP	0.016	1.645			0.167	0.865	Not supported
PL5 → MP	0.301	2.002			2.717	0.006	Supported
PL6 → MP	0.236	2.123			2.367	0.016	Supported
PL7 → MP	-0.166	1.277			1.964	0.046	Supported
PL8 → MP	0.148	2.169			1.310	0.177	Not supported
PL1 → PL5	0.237	1.185			2.572	0.011	Supported
PL1 → PL6	0.189	1.185			2.426	0.016	Supported
PL2 → PL7	0.328	1.000			3.959	0.000	Supported
PL3 → PL5	0.232	1.283			3.161	0.002	Supported
PL3 → PL6	0.157	1.283			2.816	0.005	Supported
PL4 → PL5	-0.376	1.365			4.297	0.000	Supported
PL4 → PL6	-0.278	1.365			3.037	0.003	Supported
PL8 → PL5	0.434	1.563			5.368	0.000	Supported
PL8 → PL6	0.529	1.563			7.160	0.000	Supported

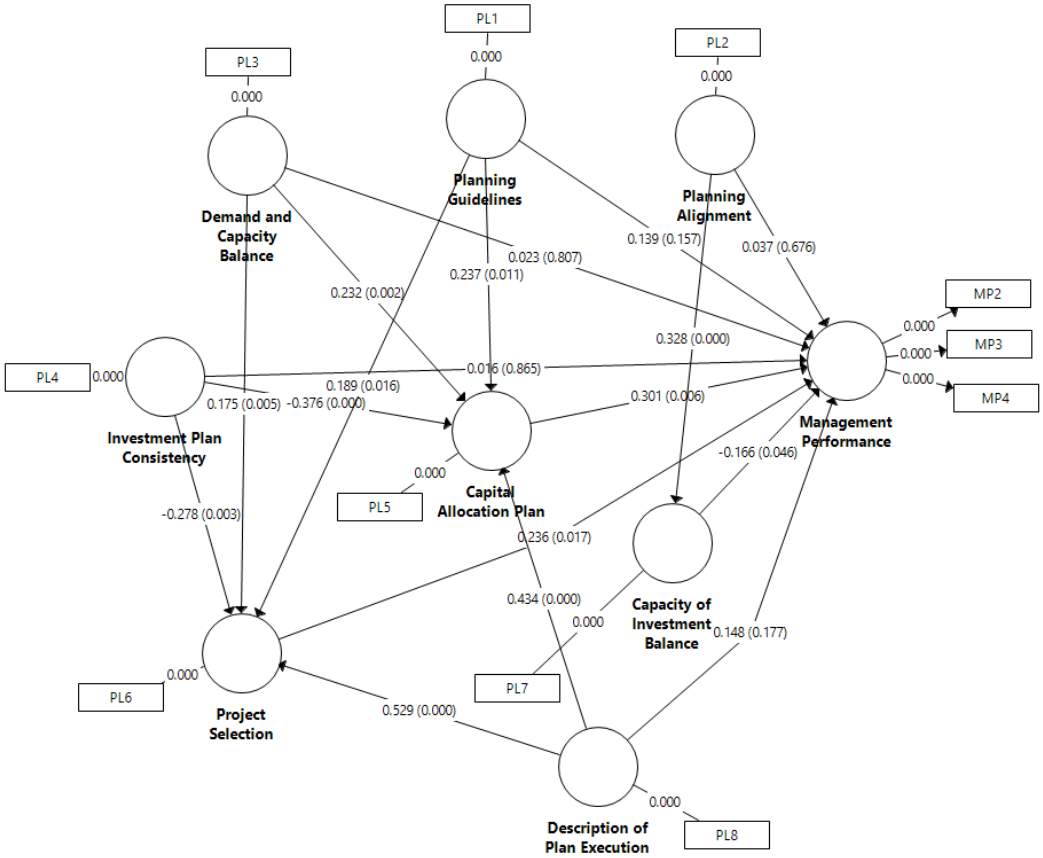

Fig. 2 *Influence of planning behaviour on management performance*

4.3 Interpretations

The empirical results underscore a differentiated behavioral influence on management performance in public construction investment. While only three planning behaviors—Capital Allocation Planning (PL5), Project Selection (PL6), and Capacity of Investment Balance (PL7)—exhibited statistically significant direct effects, other behaviors demonstrated meaningful indirect roles that support performance through mediated pathways. This layered structure points to the complexity of planning behaviors in public sector settings, where procedural and strategic elements intertwine to influence outcomes.

Capital Allocation Planning (PL5) exhibited the most substantial positive effect on management performance ($\beta = 0.301$, $p < 0.05$), highlighting its critical role in public investment systems. In the public sector, where funding constraints and administrative oversight are prominent, effective capital allocation becomes a strategic act rather than a routine task. The finding aligns with prior research that emphasizes the importance of evidence-based, criteria-driven allocation mechanisms to achieve cost-effectiveness and timeliness in infrastructure delivery [20, 30]. In Vietnam's context, where medium-term investment plans are linked to national socio-economic strategies, this behavior ensures that limited capital is deployed where it is most needed and most feasible—reinforcing the strategic coherence of planning outcomes.

Project Selection (PL6) also demonstrated a positive and significant effect on performance ($\beta = 0.236$, $p < 0.05$), consistent with the World Bank's Public Investment Management (PIM) framework, which advocates for robust appraisal and prioritization processes to avoid inefficiencies and political distortions [30]. In settings where inter-agency bargaining and regional balancing often influence decisions; this finding suggests that formalizing transparent project evaluation criteria can enhance project readiness and alignment with national objectives. However, the moderate size of the effect implies that selection alone is insufficient—well-chosen projects still require effective capital allocation (PL5) and execution planning (PL8) to translate into high performance [26, 45].

Interestingly, Capacity of Investment Balance (PL7) was negatively associated with performance ($\beta = -0.166$, $p < 0.05$), revealing a counterintuitive dynamic. While fiscal balance is a foundational principle in public finance, its over-application may restrict the system's flexibility to respond to emergent project needs. This aligns with

Blanchard [19] and Gros [23], who suggest that excessive emphasis on fiscal conservatism in low-interest environments may delay socially beneficial investments. In the context of infrastructure planning, overly rigid attempts to balance investment resources across projects may create fragmentation, defer high-impact initiatives, and reduce system responsiveness. These results suggest a need for adaptive planning behaviors that allow for scenario-based management rather than strict budgetary equilibrium.

Moreover, the negative association may reflect a trade-off between financial discipline and strategic agility. Excessive focus on balancing investment capacity—aiming to equalize resource allocation without adequately considering project urgency or transformative potential—can result in underutilization of capital or suboptimal project phasing. Mazzucato and Penna [34] argue that value creation in public investment requires strategic prioritization, not mechanical fiscal rules. Spreading limited resources thinly across numerous projects in an attempt to maintain fiscal symmetry can dilute effectiveness, increase transaction costs, and undermine performance [43].

Beyond these direct effects, the roles of Planning Guidelines (PL1), Demand and Capacity Balance (PL3), Investment Plan Consistency (PL4), and Plan Execution Description (PL8) are better understood through their indirect contributions. While not directly significant predictors of performance, these behaviors shape strategic outcomes through their influence on PL5 and PL6. For example, PL1 significantly affects both capital allocation and project selection (PL5: $\beta = 0.237$, PL6: $\beta = 0.189$, $p < 0.05$), indicating that clear dissemination of planning procedures and expectations lays the foundation for more effective strategic decisions. This reinforces organizational behavior literature that emphasizes the importance of clear guidelines and shared understanding in enabling coordinated action [31, 47].

Similarly, PL3, representing demand-capacity balancing, positively affects both PL5 ($\beta = 0.232$) and PL6 ($\beta = 0.157$), illustrating its upstream influence on planning coherence and feasibility alignment [32]. This finding supports the idea that technical assessments of demand and capacity, while not directly linked to performance, are essential precursors to meaningful investment decisions. Likewise, PL8—execution descriptions—exerts strong influence on both strategic behaviors (PL5: $\beta = 0.434$; PL6: $\beta = 0.529$), confirming that performance is enhanced when detailed implementation plans are integrated early in the decision-making cycle [9, 30].

A notable insight is the negative indirect influence of Investment Plan Consistency (PL4) on PL5 ($\beta = -0.376$) and PL6 ($\beta = -0.278$), suggesting that strict alignment between annual and medium-term plans may constrain adaptability. While consistency is traditionally seen as beneficial [1, 17], excessive rigidity may hinder the ability to recalibrate plans in light of new information or changing conditions. This resonates with Pinto J. K. and Slevin D. P. [15], who caution against over-structuring in complex project environments.

Taken together, these findings support a multi-level behavioral model, in which strategic behaviors (PL5 and PL6) serve as primary performance drivers, while technical or procedural behaviors (PL1, PL3, PL4, PL8) act as enablers that shape the conditions for strategic effectiveness. This structure reflects the layered nature of public planning, where compliance, coordination, and information-sharing underpin higher-order decision-making and implementation success.

4.4 Implications

4.4.1 Theoretical Implications

This study contributes to the development of a more nuanced understanding of behavioral performance models in public sector project management:

- First, it challenges the assumption of behavioral symmetry by demonstrating that not all planning behaviors are equally influential. Only select strategic behaviors exhibit direct performance impacts.
- Second, it extends the Theory of Planned Behavior (TPB) by highlighting the importance of behavioral mediation in institutional contexts, where actions are embedded in hierarchical and procedural structures [38].
- Third, the findings underscore the value of using function-specific constructs, rather than generalized behavioral indicators, to capture context-sensitive planning dynamics in public investment systems [48, 49].

4.4.2 Policy Implications

- Institutionalize performance-based capital allocation**:** Transitioning from quota-based to criteria-driven allocation systems would align planning with sectoral goals and implementation capacities.
- Reform project appraisal and selection processes**:** Policies should mandate transparent selection procedures and integrate socio-economic impact assessments to filter suboptimal proposals.
- Promote adaptive fiscal balancing**:** Legal and regulatory frameworks should support dynamic resource management strategies that allow agencies to respond to implementation constraints in real time.

- Improve alignment between medium-term and annual plans**:** Addressing the misalignment implied by the negative PL4 coefficient could enhance strategic coherence and execution readiness.

4.4.3 Managerial Implications

- Prioritize training in strategic planning behaviors**:** Capacity development programs should emphasize capital allocation and project selection as critical competencies for public investment professionals.
- Foster cross-functional integration**:** Align procedural tasks such as guideline dissemination and execution detailing with higher-level strategic decisions to improve planning coherence.
- Establish institutional feedback loops**:** Embedding monitoring and evaluation mechanisms within the planning cycle will enable learning and adaptation, enhancing long-term effectiveness.

5. Conclusion

This study developed and empirically tested a conceptual framework of planning behaviors in the context of public construction investment, with a specific focus on the Vietnamese infrastructure sector. Drawing on management science and institutional planning theory, eight distinct behavioral dimensions were identified, and their influence on management performance was assessed using Partial Least Squares Structural Equation Modeling (PLS-SEM) based on survey data from experienced public sector professionals.

The findings revealed that Capital Allocation Planning (PL5) and Project Selection (PL6) have a significant and positive impact on management performance, reaffirming the importance of strategic resource allocation and investment prioritization in enhancing project outcomes. Interestingly, Capacity of Investment Balance (PL7) demonstrated a significant but negative relationship with performance, suggesting that excessive emphasis on balancing fiscal constraints may hinder responsiveness and reduce implementation effectiveness.

Furthermore, while five planning behaviors (PL1, PL2, PL3, PL4, PL8) did not exhibit direct effects on performance, they significantly influenced the strategic decision-making behaviors (PL5 and PL6), indicating the presence of critical mediated pathways. This insight supports a layered behavioral model in which technical or procedural planning activities indirectly enhance performance by enabling more impactful strategic behaviors.

From a theoretical perspective, the study contributes to the refinement of behavior-performance models in public project management by demonstrating that not all managerial behaviors have direct utility, and that inter-behavioral mediation plays a crucial role in public sector planning systems. Practically, the research provides targeted recommendations for reforming capital allocation processes, improving project appraisal standards, and encouraging more adaptive planning approaches under fiscal constraints.

Despite these contributions, the study faces several limitations:

- Context specificity: The research is focused on Vietnam's public construction sector, which limits the generalizability of findings to other national or institutional contexts with different governance and planning frameworks.
- Cross-sectional data: The use of a single survey wave limits the ability to capture dynamic changes in planning behaviors or performance over time. Longitudinal studies would provide deeper insight into causal relationships and temporal effects.
- Self-reported measures: Management performance was assessed through respondents' perceptions, which may introduce subjective bias. Future studies could integrate objective performance indicators (e.g., delays, cost overruns, disbursement rates) for triangulation.
- Unmodeled moderators: The model does not account for contextual moderators such as organizational culture, leadership style, or regulatory pressure, which may condition the effects of planning behaviors on outcomes.

Addressing these limitations opens several avenues for future research, such as expanding the behavioral model to other public service domains, incorporating multilevel or multi-actor analysis, and developing tools to assess behavioral maturity in public investment agencies.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: ***study conception and design:*** *Luong Hai Nguyen, Van Thuan Do;* ***data collection:*** *Tuan Phong Tran, Phuong Anh Nguyen;* ***analysis and interpretation of results:*** *Van Thuan Do, Luong Hai Nguyen;* ***draft manuscript preparation:*** *Luong Hai Nguyen, Phuong Anh Nguyen. All authors reviewed the results and approved the final version of the manuscript.*

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