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Article

Modeling of leadership behavior framework for road usage charge management in Vietnam

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Abstract: Leadership behavior is a critical component of effective management, significantly influencing organizational success. While extensive research has examined key success factors in road management, the specific role of leadership behaviors in road usage charging (RUC) management remains underexplored. This study addresses this gap by identifying and analyzing leadership behavior dimensions and their impact on management performance within the RUC context. Using a mixed-methods approach, focus group discussions with industry practitioners were conducted to define eight leadership behavior dimensions: Central-Level Leadership Guidance (LE1), Local-Level Leadership Guidance (LE2), Central-Level Leadership Commitment (LE3), Local-Level Leadership Commitment (LE4), Subordinate Understanding from Central-Level Leadership (LE5), Subordinate Understanding from Local-Level Leadership (LE6), Work Motivation (LE7), and Understanding Rights and Obligations (LE8). These dimensions were further validated through a quantitative survey distributed to 138 professionals involved in RUC management in Vietnam, with the data analyzed using structural equation modeling (SEM) and partial least squares (PLS) estimation. The findings revealed that LE3 (Central-Level Leadership Commitment) had the strongest direct impact on management performance (MP) and mediated the relationships between other leadership dimensions and management outcomes. This study contributes to the theoretical understanding of leadership in RUC management by highlighting the centrality of leadership commitment and offering practical insights for improving leadership practices to enhance organizational performance in infrastructure management.

Keywords: road usage charging; organizational management behavior; leading function; leadership behavior; road infrastructure management

1. Introduction

The concept of Road Usage Charging (RUC) has emerged as a significant focus in the quest for sustainable transportation funding and congestion management. As traditional funding mechanisms, such as fuel taxes, face challenges due to declining revenues and evolving transportation patterns, RUC offers a promising alternative. Extensive research has highlighted key elements that influence the adoption, implementation, and effectiveness of RUC systems. These studies span diverse areas, including policy design, technological innovations, public acceptance, equity considerations, and legal frameworks, offering valuable insights into the complexities of RUC systems.

Early foundational work by Rouwendal and Verhoef (2004) explored the interplay between pricing strategies, capacity decisions, and financing mechanisms within transportation networks. Their analysis of the self-financing potential of

optimally designed and priced roads provided critical insights into second-best regulatory scenarios in network settings. Similarly, Bolderdijk et al. (2011) examined behavioral incentives for reducing driving speed through Pay-As-You-Drive insurance schemes, demonstrating how explicit financial incentives could influence driver behavior. These contributions underscore the multifaceted nature of RUC systems and the importance of understanding various interrelated factors.

Policy considerations are central to the design and operation of RUC systems, addressing objectives such as congestion mitigation, revenue generation, and environmental sustainability (Atkinson, 2019). These considerations encompass pricing strategies, exemptions, and revenue allocation mechanisms tailored to jurisdictional needs. Technological advancements play a pivotal role in enabling RUC systems, with research focusing on data collection methods, billing technologies, and enforcement mechanisms, alongside challenges of interoperability, data security, and privacy (Cottingham et al., 2007; Eun et al., 2009; Ochieng et al., 2010). Public acceptance and behavioral studies examine societal attitudes toward RUC, addressing concerns related to fairness, privacy, and the perceived benefits of such systems (Eun et al., 2009; Sugiarto et al., 2017). Equity considerations further analyze the distributional impacts of RUC on various socioeconomic groups and geographic regions, proposing strategies to mitigate disproportionate burdens (Levinson, 2010). Legal and regulatory frameworks provide the foundation for RUC implementation, addressing issues such as authority, data protection, and compliance enforcement (Oehry, 2010). Evaluation metrics and performance assessments, focusing on indicators like revenue generation, congestion alleviation, environmental benefits, and system efficiency, underscore the importance of evidence-based policy design.

Understanding the success or failure of Road Usage Charging (RUC) initiatives requires more than an examination of structural or systemic factors, such as technological capabilities, policy frameworks, or public acceptance. While these elements are vital, they do not operate independently; leadership plays a critical role in orchestrating their alignment and operationalization to achieve desired outcomes. Overlooking the influence of leadership reduces the complexity of RUC initiatives to purely mechanistic factors, failing to account for the human and organizational dynamics that drive their success.

As highlighted by Grinerud et al. (2021) and Kramer and Porter (2006), effective leadership strategies can provide organizations with a competitive edge by fostering innovation, enhancing adaptability, and ensuring cohesive stakeholder engagement. Within the context of RUC systems, leadership is essential for addressing the diverse technical, administrative, and political challenges that arise throughout the implementation process. Leaders must integrate advanced technologies, streamline organizational procedures, and navigate the political landscape to gain public and institutional support.

Specific leadership behaviors, such as strategic foresight, adaptive problem-solving, and effective communication, are instrumental in managing these complexities (Nguyen, 2024a). A leader with strategic foresight can align RUC initiatives with broader societal objectives, such as reducing environmental impacts or promoting equitable transportation funding. Similarly, adaptive leadership enables swift responses to unexpected obstacles, such as public resistance or technical

malfunctions, ensuring that setbacks do not derail progress. Strong communication skills further support these efforts by building trust, addressing stakeholder concerns, and fostering collaboration among diverse groups.

Analyzing the relationship between leadership behaviors and management performance provides a more nuanced understanding of the factors that drive organizational success (Nguyen, 2022, 2024c). Leadership significantly shapes both the internal dynamics of organizations responsible for managing RUC systems and their external engagements with stakeholders, including policymakers, the public, and advocacy groups. For instance, leaders who prioritize transparency and fairness can address public concerns regarding equity and privacy, thereby fostering greater societal acceptance and legitimacy of RUC initiatives. Additionally, visionary leaders can articulate a clear and compelling narrative about the benefits of RUC systems, effectively uniting stakeholders around shared objectives and ensuring sustained commitment to the initiative.

Road usage charge (RUC) management in Vietnam is a critical strategy for financing road infrastructure and addressing challenges related to urbanization and increasing vehicle ownership. As a developing nation, Vietnam relies on mechanisms such as toll collection and electronic road pricing to generate revenue for constructing, maintaining, and expanding its road networks. However, the system faces significant challenges, including institutional complexity due to multi-tier governance, public skepticism about the transparency and fairness of toll pricing, and technological barriers like limited infrastructure and interoperability issues. Cultural factors, such as centralized decision-making and hierarchical organizational structures, also influence the effectiveness of leadership and management in the sector.

To enhance RUC management, leaders must adopt a visionary approach that aligns stakeholders with long-term transportation goals, fosters collaboration between central and local agencies, and addresses public concerns through transparent practices. Investments in advanced technologies, such as electronic toll collection systems, can streamline operations and reduce revenue leakage. Additionally, leadership development programs tailored to RUC management can equip managers with skills to navigate complex challenges. Drawing lessons from successful RUC systems globally while adapting them to Vietnam's unique socio-cultural context offers opportunities to build a more efficient, equitable, and sustainable framework for road usage management. These efforts are crucial for supporting the nation's infrastructure development and promoting sustainable urban and economic growth.

Despite its critical significance, the role of leadership in the success of Road Usage Charging (RUC) initiatives remains underexplored in academic research. This gap highlights an opportunity to advance understanding of how specific leadership traits and behaviors shape the implementation and management of these systems. Examining leadership styles, such as transformational and transactional approaches, and their influence on organizational outcomes can yield valuable insights into effective practices. Furthermore, a focus on leadership within RUC initiatives can support the design of targeted training programs aimed at equipping leaders with the competencies required to address the distinctive challenges of these systems. Thus, while structural and systemic factors provide the foundational framework for RUC

success, leadership acts as a cohesive force that integrates these elements, ensuring coordinated and effective implementation.

This study aims to provide a more comprehensive examination of leadership behaviors and their impact on management performance, thereby enriching the academic understanding of Road Usage Charging (RUC) initiatives. By exploring the role of leadership, this research offers practical insights for enhancing the effectiveness and efficiency of RUC systems. Acknowledging the central importance of leadership in this context facilitates a more holistic approach to addressing the challenges associated with sustainable transportation funding and congestion management.

2. Theoretical foundation

2.1. Leadership behavior development within road usage charge management

Leadership involves the process of motivating, guiding, and influencing individuals to align their efforts with the objectives of the organization (Lepsinger and Yukl, 2005; Williams, 2017). According to behavioral theory, leadership is often examined through two key dimensions: Initiating structure and consideration (Coons and Stogdill, 1957; Halpin and Winer, 1957). Initiating structure refers to how leaders establish roles for their followers by setting clear goals, providing guidance, creating timelines, and assigning specific tasks. Leaders typically articulate a vision, mission, and set of objectives that inspire employees and establish the organization's long-term direction. Effective leadership and management catalyze actions that foster employee involvement and commitment to organizational goals (Kirkpatick and Locke, 1991). Therefore, a leader's ability to initiate structure plays a crucial role in influencing subordinates' job performance. In contrast, the consideration leadership style emphasizes the importance of supportive and empathetic behaviors. This approach fosters an environment where employees feel comfortable raising concerns and participating in decision-making processes. As a result, the consideration dimension predominantly impacts subordinates' job satisfaction.

In the context of road usage charge management, the structure differs significantly from traditional organizational settings, as it involves multiple participants at various levels, from central to local government entities. As such, leadership behaviors are not confined to internal organizational dynamics but extend to interorganizational interactions and collaborations. Consequently, leadership behaviors in this domain require a broader, multidimensional perspective. To establish the attributes associated with leadership behavior, this study integrates both existing literature and qualitative research methodologies. These include focus group studies (FGSs) and targeted interviews, which are recognized for their effectiveness in exploring specific behaviors, understanding contextual influences, and capturing diverse perspectives on particular issues (Hennink, 2013; Nguyen, 2019, 2024b).

The research began with FGSs involving key participants, specifically professionals working in road usage charge management units. Each group comprised five participants, allowing for in-depth discussions and the refinement of leadership

attributes initially identified through literature. The FGSs and interviews followed a semi-structured approach, incorporating various components such as introductory questions, opening queries, preliminary inquiries, transition prompts, and concluding questions (Hennink, 2013; Nguyen, 2022). Additional questions were incorporated as needed to facilitate a more comprehensive exploration of the topics. In order to enhance understanding, relevant leadership literature was presented to the participants, clarifying the concept of leadership attributes. This allowed participants to engage more deeply in the discussion, focusing on questions such as: "How do you define the principles of leadership behavior in road infrastructure management?", "What characterizes leadership behavior in the context of road usage charge management?", "What attributes should be considered when assessing leadership behaviors?", and "How would you evaluate performance within road usage management?".

In conclusion, a thorough compilation of eight distinct attributes was developed for the assessment of leadership behavior (see **Table 1**). To empirically measure these attributes, single-item scales were employed, as they effectively capture unique and isolated concepts (Diamantopoulos et al., 2012). Furthermore, research by Bergkvist and Rossiter (2009) and Ann and Nguyen (2023) has validated that single-item scales possess predictive validity comparable to that of multi-item measures, aligning with the conclusions drawn by Diamantopoulos et al. (2012) and Nguyen (2024a).

Table 1. Attributes of leadership behavior with in RUC management.

Function	Attributes	Code	Descriptions
Leading (LE)	Central-level leadership guidance	LE1	The central-level leadership effectively demonstrates their role in providing guidance for the hierarchical management of state revenue collection.
	Local-level leadership guidance	LE2	Local-level leadership effectively demonstrates their role in providing guidance for the hierarchical management of state revenue collection.
	Central-level leadership commitment	LE3	The central-level leadership effectively demonstrates their commitment to the management of state revenue collection in accordance with the hierarchical structure.
	Local-level leadership commitment	LE4	The local-level leadership effectively demonstrates their commitment to the management of state revenue collection in accordance with the hierarchical structure.
	Subordinate understanding from central-level leadership	LE5	The central-level leadership ensures that individuals and subordinate units have a clear understanding of the objectives and plan for revenue collection according to the hierarchical structure.
	Subordinate understanding from local-level leadership	LE6	The local-level leadership ensures that individuals and subordinate units have a clear understanding of the objectives, project, and plan for revenue collection.
	Work motivation	LE7	The leadership effectively implements various forms of incentives to create work motivation for entities involved in the management of state revenue.
	Understanding rights and obligations	LE8	The leadership ensures that individuals and subordinate units have a clear understanding of their rights and obligations in managing state revenue.

2.2. Management performance

The strategic goals and objectives of any organization are assessed through the evaluation of its activities and managerial performance (Badiru, 2005; Santa et al., 2006). In the context of road usage charge organizations, this performance reflects the ability of both leadership and teams to efficiently allocate and utilize limited resources, thereby driving enhanced productivity, operational effectiveness, and stakeholder

satisfaction. Moreover, the measurement and assessment of managerial performance are critical in determining the efficiency and success of organizational processes, especially in sectors reliant on public resources, such as road usage charge management (Walker et al., 2011; Williams, 2017).

In the specific domain of road networks, where large-scale infrastructure projects are financed through public funds, the assessment of managerial performance is of paramount importance due to the significant financial investments and public impact involved. Performance evaluations within road usage management provide valuable insights into the effective allocation of public funds, the achievement of financial and operational goals, and compliance with regulatory requirements. Evaluating performance also contributes to ensuring that road usage charge management systems meet public expectations, including fairness, equity, and transparency.

To measure performance in road usage charge management, established frameworks such as the "iron-triangle" model (Dvir and Shenhar, 2008; Nguyen, 2019, 2024b; Pollack et al., 2018) can be applied. This model highlights three fundamental dimensions—quality, time, and cost—which are essential for evaluating performance in infrastructure organization management. In the context of road usage charge management, adapting the iron-triangle framework allows for a more tailored approach, encompassing the following specific dimensions: (1) the effective and timely collection of the designated revenues in accordance with the predetermined financial plan; (2) the adherence to scheduled timelines in revenue collection; and (3) the implementation of revenue collection procedures while minimizing management costs. These dimensions are critical for evaluating the success and efficiency of road usage management projects, offering valuable insights that guide informed decision-making and foster effective transportation infrastructure development.

2.3. Hypotheses

Leadership behaviors arguably positively impact the performance of road usage charging management. Therefore, the following hypotheses are suggested.

Hypothesis 1 (H1)—Central-level leadership guidance has a positive influence on the performance of road usage charging management.

Hypothesis 2 (H2)—Local-level leadership guidance has a positive influence on the performance of road usage charging management.

Hypothesis 3 (H3)—Central-level leadership commitment has a positive influence on the performance of road usage charging management.

Hypothesis 4 (H4)—Local-level leadership commitment has a positive influence on the performance of road usage charging management.

Hypothesis 5 (H5)—Subordinate understanding from central-level leadership has a positive influence on the performance of road usage charging management.

Hypothesis 6 (H6)—Subordinate understanding from local-level leadership has a positive influence on the performance of road usage charging management.

Hypothesis 7 (H7)—Work motivation has a positive influence on the performance of road usage charging management.

Hypothesis 8 (H8)—Understanding rights and obligations has a positive influence on the management performance of road usage charging management.

3. Methods

3.1. Data collection

The data collection process in this study was carefully designed to ensure a comprehensive and contextually relevant understanding of road usage charge management in Vietnam, informed by the insights gathered from focus group studies (FGSs) and in-depth interviews. To capture a diverse range of perspectives, a random sampling approach was utilized to select participants, specifically targeting managers within road management units. A total of 210 questionnaires were distributed to professionals with relevant experience in road usage charge management. Out of these, 138 valid responses were received and included in the analysis. The respondents, all of whom were employed in road management units, brought extensive expertise to the study. Notably, 78% of the participants had more than ten years of experience in road usage charge management, and all held at least a bachelor's degree, ensuring a highly qualified sample.

The validity of the study's findings is reinforced through several key factors. First, the random sampling method employed ensures that the sample is representative of the broader population involved in road usage charge management, thereby mitigating potential selection bias. Second, the high proportion of respondents with significant experience—78% having over a decade of involvement in road usage charge systems—adds credibility to the study's results, as these participants possess a deep understanding of the nuances and challenges inherent in the field. Third, the educational qualifications of the respondents, with all participants holding at least a bachelor's degree, guarantee that the data collected is grounded in sound theoretical and practical knowledge, enhancing the overall validity of the study.

In sum, the combination of a random sampling approach, the respondents' extensive experience, and their educational qualifications contributes to the reliability and relevance of the study's findings. These criteria collectively assure the robustness of the study, ensuring that the results accurately reflect the views and expertise of professionals directly engaged in road usage charge management in Vietnam. As such, the study provides valuable insights into the effectiveness and challenges of road usage charge systems, offering important implications for policy and practice in the field.

3.2. Measures

The survey was divided into two sections. The first section collected demographic and professional background information from the respondents, while the second focused on assessing various dimensions of leadership behavior. Participants rated their experience in road usage charge management using a five-point Likert scale, ranging from 1 (strongly disagree/not at all satisfied) to 5 (strongly agree/extremely satisfied).

To test the research hypotheses, structural equation modeling (SEM) was employed to explore the causal relationships between leadership behaviors, management performance, and their direct and indirect effects. SEM includes two main methods: Covariance-based SEM (CB-SEM) and partial least squares SEM (PLS-SEM). While CB-SEM validates theoretical models using maximum likelihood

estimation, PLS-SEM predicts dependent variables using ordinary least squares (Hair et al., 2021).

PLS-SEM was chosen for this study for two primary reasons: It requires a smaller sample size than CB-SEM (Hair et al., 2021) and tends to have fewer convergence issues (Henseler, 2010). The measurement model's reliability and validity were assessed using confirmatory factor analysis (CFA), followed by an evaluation of the structural model's explanatory power and the path coefficients to examine the relationships between the variables.

4. Results and discussion

The results show that there are significant and positive correlations between (1) Central-level leadership commitment (LE3) and management performance (MP) (β = 0.010, $p < 0.05$) (**Table 2**); (2) Central-level leadership guidance (LE1) and Central-level leadership commitment (LE3) (β = 0.602, $p < 0.000$) (**Table 2**); (3) Local-level leadership guidance (LE2) and Central-level leadership commitment (LE3) (β = −0.281, $p < 0.05$) (**Table 2**); (4) Local-level leadership commitment (LE4) and Central-level leadership commitment (LE3) (β = 0.387, $p < 0.05$) (**Table 2**); (5) Subordinate understanding from central-level leadership (LE5) and Central-level leadership commitment (LE3) (β = 0.259, $p < 0.05$) (**Table 2**); (6) Subordinate understanding from local-level leadership (LE6) and Central-level leadership commitment (LE3) (β = −0.222, $p < 0.05$) (**Table 2**); (7) Work motivation (LE7) and Central-level leadership guidance (LE1) (β = 0.205, $p < 0.05$) (**Table 2**), Work motivation (LE7) and Local-level leadership guidance (LE2) (β = 0.327, $p < 0.000$) (**Table 2**), Work motivation (LE7) and Local-level leadership commitment (LE4) (β = 0.248, $p < 0.05$) (**Table 2**), Work motivation (LE7) and Subordinate understanding from local-level leadership (LE6) (β = 0.368, $p < 0.05$) (**Table 2**), Understanding rights and obligations (LE8) and Central-level leadership guidance (LE1) (β = 0.308, $p < 0.05$) (**Table 2**), Understanding rights and obligations (LE8) and Local-level leadership guidance (LE2) (β = 0.341, $p < 0.000$) (**Table 2**), Understanding rights and obligations (LE8) and Local-level leadership commitment (LE4) (β = 0.441, $p < 0.000$) (**Table 2**), Understanding rights and obligations (LE8) and Subordinate understanding from central-level leadership (LE5) (β = 0.552, $p < 0.000$) (**Table 2**), Understanding rights and obligations (LE8) and Subordinate understanding from local-level leadership (LE6) (β = 0.508, $p < 0.000$) (**Table 2**).

The results provide evidence to support Hypotheses H3. **Figure 1** shows that the dimension of Central-level leadership commitment (LE3) directly influences on the management performance (MP) in the model, which explained 26,5% of the variation in MP ($p < 0.000$). However, there are no straight significant relationships between Central-level leadership guidance (LE1) and management performance (MP) (H1) (β = 0.010, $p > 0.05$) (**Table 2**), Local-level leadership guidance (LE2) and management performance (MP) (H2) (β = −0.142, $p > 0.05$) (**Table 2**), and Local-level leadership commitment (LE4) and management performance (MP) (H4) (β = 0.190, $p > 0.05$) (**Table 2**), Subordinate understanding from central-level leadership (LE5) and management performance (MP) (H5) (β = 0.191, $p > 0.05$) (**Table 2**), Subordinate understanding from local-level leadership (LE6) and management performance (MP)

(H6) (β = 0.028, p > 0.05) (**Table 2**), Work motivation (LE7) and management performance (MP) (H7) (β = 0.119, p > 0.05) (**Table 2**), Understanding rights and obligations (LE8) and management performance (MP) (H8) (β = 0.156, p > 0.05) (**Table 2**).

Table 2. The results of hypotheses testing.

Hypotheses	**Coef.**	**VIF**	***R* square**	***R* square adjusted**	***f* Square**	***T* values**	***P* Values**	**Interpretation**
LE1 → MP	0.010	2.869	0.308	0.265	0.000	0.074	0.941	Not supported
LE2 → MP	−0.142	3.123			0.009	1.022	0.307	Not supported
LE3 → MP	0.217	2.126			0.032	2.014	0.044	Supported
LE4 → MP	0.190	2.663			0.020	1.395	0.163	Not supported
LE5 → MP	0.191	3.136			0.017	1.525	0.127	Not supported
LE6 → MP	−0.028	3.226			0.000	0.209	0.834	Not supported
LE7 → MP	0.119	1.414			0.014	1.125	0.261	Not supported
LE8 → MP	0.156	1.791			0.020	1.129	0.259	Not supported
LE1 → LE3	0.602	2.079			0.307	5.835	0.000	Supported
LE2 → LE3	−0.281	2.882			0.058	2.085	0.037	Supported
LE4 → LE3	0.387	2.184			0.145	3.239	0.001	Supported
LE5 → LE3	0.259	2.941			0.048	2.282	0.023	Supported
LE6 → LE3	−0.222	2.914			0.036	2.393	0.017	Supported
LE7 → LE1	0.205	1.221			0.043	2.495	0.013	Supported
LE7 → LE2	0.327	1.221			0.129	4.044	0.000	Supported
LE7 → LE4	0.248	1.221			0.077	3.109	0.002	Supported
LE7 → LE6	0.368	1.000			0.046	2.378	0.017	Supported
LE8 → LE1	0.308	1.221			0.096	3.165	0.002	Supported
LE8 → LE2	0.341	1.221			0.140	3.710	0.000	Supported
LE8 → LE4	0.441	1.221			0.244	5.139	0.000	Supported
LE8 → LE5	0.522	1.000			0.374	5.817	0.000	Supported
LE8 → LE6	0.508	1.000			0.338	5.774	0.000	Supported

Calculation method: Two-stage; Product term generation: Standardized.

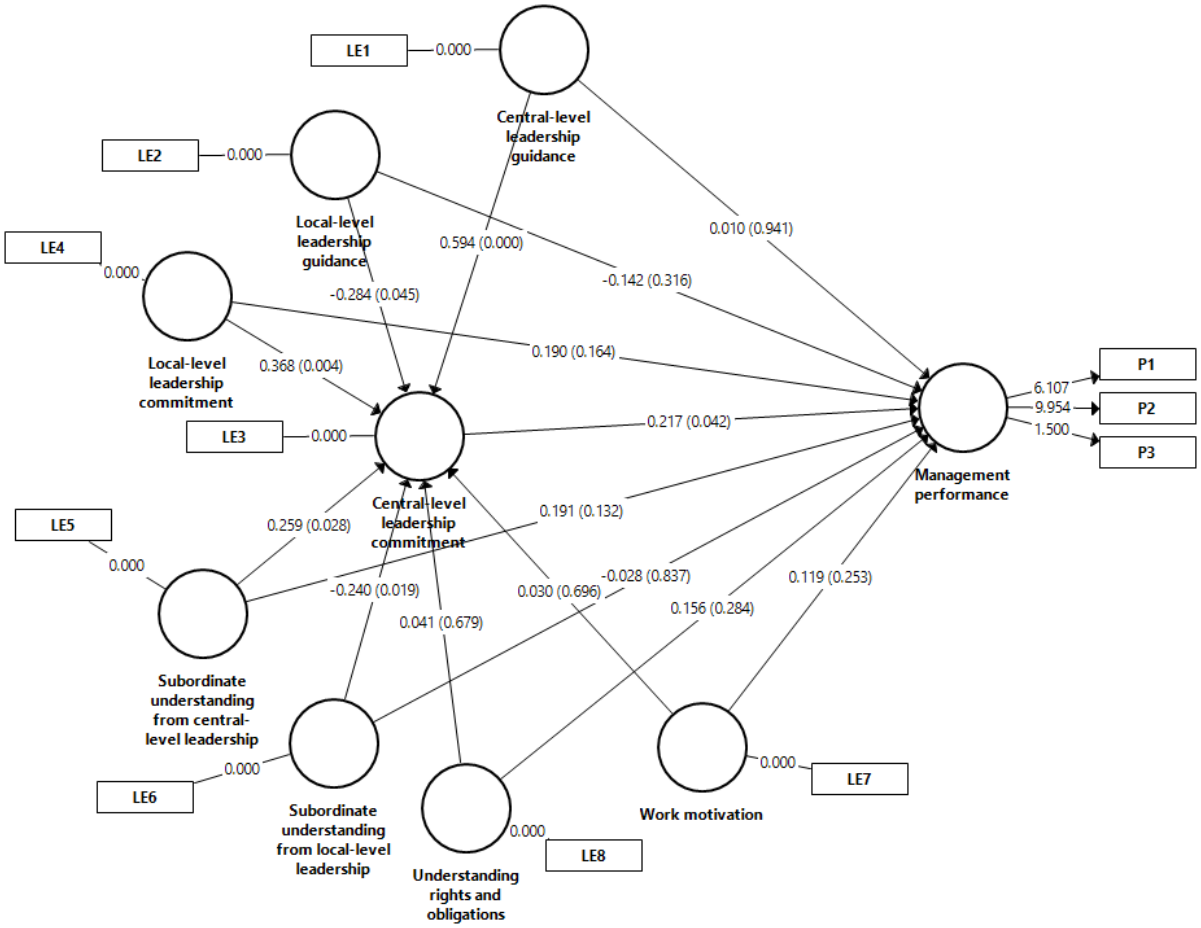

Figure 1. Leadership behaviors and management performance.

Additionally, to assess potential multicollinearity among the independent variables in the regression model, a variance inflation factor (VIF) test was performed. The results indicated that all VIF values were below 3.226, well below the threshold of 10 suggested by Hair et al. (1998), suggesting the absence of multicollinearity and supporting the reliability of the data with small standard errors (Field, 2000). To evaluate discriminant validity, the square root of the average variance extracted (AVE) was compared to the correlations between latent constructs. Following the guidelines of Hair et al. (2021), it is expected that the square root of each construct's AVE should exceed its correlations with other constructs. As shown in **Table 3**, the results confirm that discriminant validity is maintained, with the eight leadership behaviors demonstrating clear differentiation from one another.

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

Latent constructs		AVE	Latent constructs							
			LE3	LE1	LE4	LE2	LE5	LE6	LE8	LE7
Central-level leadership commitment	(LE3)	1.000	1.000							
Central-level leadership guidance	(LE1)	1.000	0.643	1.000						
Local-level leadership commitment	(LE4)	1.000	0.407	0.359	1.000					
Local-level leadership guidance	(LE2)	1.000	0.314	0.559	0.699	1.000				

Table 3. (*Continued*).

Latent constructs		AVE	Latent constructs							
			LE3	LE1	LE4	LE2	LE5	LE6	LE8	LE7
Subordinate understanding from central-level leadership	(LE5)	1.000	0.542	0.656	0.513	0.532	1.000			
Subordinate understanding from local-level leadership	(LE6)	1.000	0.313	0.503	0.601	0.675	0.728	1.000		
Understanding rights and obligations	(LE8)	1.000	0.347	0.396	0.546	0.480	0.522	0.588	1.000	
Work motivation	(LE7)	1.000	0.254	0.337	0.435	0.472	0.300	0.403	0.426	1.000

In line with Hypotheses H3, the present study contributes to the growing body of evidence supporting the positive impact of the organizing function on the management performance of road usage charge management. The findings provide further empirical support to the notion that effective organizational structures and processes play a vital role in achieving favorable outcomes in this specific context. The specific aspect of the organizing function examined in this study is Central-level leadership commitment (LE3), which refers to the extent to which leaders at the central level of the organization demonstrate dedication and involvement in the implementation and oversight of road usage charge management initiatives. The results of this study reveal that Central-level leadership commitment has a direct influence on enhancing the overall management performance. This finding highlights the importance of strong and committed leadership in ensuring the successful implementation and execution of road usage charge management strategies. By emphasizing the significance of central-level leadership commitment, this study provides practical insights for organizations involved in road usage charge management. It suggests that organizations should prioritize the cultivation of a supportive leadership culture that encourages commitment, involvement, and engagement at the central level. This can be achieved through various means such as clearly communicating the organizational goals and vision, providing necessary resources and support, and fostering an environment that encourages leadership commitment. Furthermore, the results of this study emphasize the need for organizations to develop and implement strategies that promote the identified leading behaviors. Organizations should consider incorporating leadership training programs, performance evaluation systems, and reward mechanisms that reinforce and incentivize central-level leadership commitment. These strategies can help ensure that leaders are equipped with the necessary skills and motivation to effectively guide and evaluate road usage charge management initiatives.

However, it is crucial to acknowledge that the findings did not establish a significant direct relationship between the leading behaviors of Central-level leadership guidance (LE1), Local-level leadership guidance (LE2), Local-level leadership commitment (LE4), Subordinate understanding from central-level leadership (LE5), Subordinate understanding from local-level leadership (LE6), Work motivation (LE7), Understanding rights and obligations (LE8) and the management performance of road usage charge management. Instead, these leading behaviors appear to have indirect relationships with management performance through the mediating factor of Central-level leadership commitment (LE3). The absence of a significant direct relationship between these leading behaviors and management

performance highlights the complexity of the relationship between leadership factors and the effectiveness of road usage charge management. It suggests that central-level leadership management is key to other behaviors in terms of influencing on management performance.

However, it is crucial to acknowledge that the findings of this study did not establish a statistically significant direct relationship between the leading behaviors, such as Central-level leadership guidance (LE1), Local-level leadership guidance (LE2), Local-level leadership commitment (LE4), Subordinate understanding from central-level leadership (LE5), Subordinate understanding from local-level leadership (LE6), Work motivation (LE7), Understanding rights and obligations (LE8), and the management performance of road usage charge management. These results indicate that the influence of these leading behaviors on management performance is not directly evident. Instead, the study reveals that these leading behaviors appear to have indirect relationships with management performance, operating through the mediating factor of Central-level leadership commitment (LE3). This implies that the impact of the identified leading behaviors on management performance is dependent on the level of central-level leadership commitment demonstrated within the organization. The findings highlight the complex nature of the relationship between various leadership factors and the effectiveness of road usage charge management.

The absence of a significant direct relationship between the leading behaviors and management performance suggests that central-level leadership management plays a pivotal role in influencing management performance in conjunction with other behaviors. Central-level leadership commitment acts as a mediating mechanism through which the effects of other leading behaviors manifest and ultimately impact management performance. This insight underscores the importance of central-level leadership in road usage charge management initiatives. It suggests that organizations should focus on cultivating and reinforcing central-level leadership commitment as a fundamental aspect of their management strategies. By prioritizing central-level leadership commitment, organizations can create an environment that facilitates the effectiveness of other leading behaviors and, in turn, positively influences management performance.

The findings of this study have significant implications for practice in the management of road usage charge (RUC) systems, particularly regarding the integration of leadership behaviors into daily management practices and their influence on policy development and implementation. The identification of Central-level leadership commitment (LE3) as a crucial factor influencing management performance suggests that organizations should prioritize strengthening leadership commitment at the central level. Practically, this means that central leadership should play an active role in setting clear strategic directions, allocating necessary resources, and ensuring sustained engagement in the oversight of RUC initiatives. To integrate these dimensions of leadership into daily management practices, organizations should establish structured communication channels that promote transparency, foster accountability, and ensure that leadership remains directly involved in key decisions. This could involve regular updates from central leadership to all stakeholders involved in RUC management, as well as the development of formal feedback mechanisms to ensure leaders are continuously informed of challenges and progress.

Moreover, the study highlights the importance of aligning leadership behaviors such as Central-level leadership guidance (LE1) and Subordinate understanding from central-level leadership (LE5) with organizational goals. These behaviors can be integrated into daily management practices by fostering a culture where leaders at the central and local levels actively guide their teams, clarify roles and expectations, and create an environment of mutual understanding and trust. This would involve leadership training programs that emphasize the importance of clear communication, guidance, and responsiveness to feedback, ensuring that employees at all levels understand their roles in the success of RUC systems.

In terms of policy development and implementation, the findings suggest that central-level leadership is vital to the success of RUC policies. Policymakers should consider developing frameworks that strengthen the role of central leadership in shaping, implementing, and monitoring RUC initiatives. This could include establishing centralized bodies or leadership teams responsible for overseeing RUC programs, ensuring consistent policy application across jurisdictions, and evaluating the effectiveness of these policies. Furthermore, policies should be designed to support continuous leadership development at the central level, such as through leadership training initiatives and performance evaluation systems, which reinforce the behaviors identified in this study. By prioritizing central leadership commitment, these policies can ensure a more coordinated and efficient approach to RUC management, ultimately leading to more successful implementation and improved performance outcomes.

In summary, the study's findings offer several practical implications for organizations and policymakers involved in RUC systems. By emphasizing the integration of central-level leadership commitment and other key leadership behaviors into daily management practices, and ensuring that policies support the development and empowerment of leadership at the central level, organizations can improve their RUC management performance and foster more effective policy outcomes.

5. Conclusions

This research introduces an innovative conceptual framework for the leading function in road usage charge (RUC) management, offering fresh perspectives and improved strategies for this critical domain. By integrating focus group sessions (FGSs), a comprehensive literature review, and targeted interviews with industry professionals, the study identified eight distinctive attributes of leadership behavior. These attributes were empirically tested using structural equation modeling (SEM) with partial least squares (PLS) estimation, based on data collected from Vietnam. This methodological approach ensured robust evaluation of the framework's reliability, factor structure, and the intricate relationships between leadership dimensions and management performance.

The study's findings highlight the innovative delineation of leadership behaviors in RUC management, emphasizing attributes such as Central-level leadership guidance (LE1), Local-level leadership guidance (LE2), Central-level leadership commitment (LE3), and others, tailored specifically to the RUC context. Notably, Central-level leadership commitment (LE3) emerged as a pivotal driver of enhanced management performance, acting as both a direct influencer and a mediator for other

leadership dimensions. These insights underline the necessity of fostering centralized commitment to optimize performance outcomes while acknowledging the interdependence of various leadership behaviors. This research advances the field by presenting actionable strategies for stakeholders, advocating for heightened engagement, collaborative decision-making, and the strategic alignment of leadership practices to address the complexities of RUC management. By shedding light on these dynamics, the study contributes to more effective and sustainable management frameworks, paving the way for future improvements in infrastructure financing and governance.

This study acknowledges several limitations that warrant consideration. First, the relatively small sample size may influence the robustness of the analysis outcomes, and increasing the sample size in future studies could lead to more accurate and generalizable results. Second, leadership styles are often context-dependent and may vary across different situations, influenced by both organizational and cultural factors. Given these considerations, further research is needed to explore the underlying mechanisms and dynamics of the indirect relationships between the identified leadership behaviors and management performance. Future studies should examine the specific interactions and interdependencies among these factors to develop a more comprehensive understanding of the complexities involved in road usage charge (RUC) management.

Additionally, as leadership behaviors may be shaped by cultural influences, it is essential for future research to incorporate cross-cultural comparisons to investigate how leadership behaviors in RUC management differ across cultural contexts. Cultural norms and values can significantly affect how leadership is perceived, how commitment and guidance are expressed, and how management strategies are implemented (Nguyen et al., 2016). For instance, the impact of central-level leadership commitment (LE3) on management performance may differ in collectivist cultures, where emphasis is placed on group cohesion and collaboration, compared to individualist cultures, which may prioritize autonomy and individual responsibility. Similarly, leadership behaviors may vary across hierarchical versus egalitarian organizational structures, further influencing management outcomes.

By integrating cross-cultural elements, future research can offer valuable insights into how cultural differences shape leadership effectiveness within RUC management. This approach will contribute to a more nuanced understanding of global RUC practices and help identify leadership strategies and best practices that can be adapted to diverse cultural environments.

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