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The Mediating Role of Transition Management in the Relationship of Strategic Planning Systems and Sustainable Urban Road Infrastructure Development among Town Councils in Uganda

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Abstract

As cities strive to create sustainable road infrastructure, the integration of strategic planning systems and transition management becomes imperative in guiding the complex transformation process and aligning efforts towards sustainable outcomes. This study explores the mediating role of transition management in the relationship between strategic planning systems and sustainable urban road infrastructure development. The study utilized a descriptive cross-sectional survey design. The target population consisted of Town councils in Uganda. Data was collected through a structured questionnaire using the drop and pick later method, and the mediation effect was evaluated using path analysis. The findings indicate that transition management plays a partial mediating role in the relationship between strategic planning systems and sustainable urban road infrastructure development among Town councils in Uganda (path coefficient = .435). The study concludes that strategic planning systems impact sustainable urban road infrastructure through transition management, advocating participatory planning. Since diverse actors are involved, effective stakeholder knowledge sharing is vital for collective problem-solving and sustainable urban road development.

Keywords

Moderating Role, Strategic Planning Systems, Transition Management, Sustainable Urban Road Infrastructure Development, Uganda, Town Councils

1. Introduction

Road infrastructure stands as a vital public resource crucial for worldwide socioeconomic progress (Koks et al., 2019; Wang et al., 2019). Constructing sustainable road infrastructure is crucial for comprehensive societal development (Song & Wu, 2021). To achieve sustainable road infrastructure development, it is essential to improve both the quantity and quality of roads, requiring a thorough understanding of how these factors interact for informed strategic decision-making. Amidst worldwide environmental and societal shifts, cities are confronting mounting challenges, necessitating a thorough reassessment and adjustment of their transportation infrastructures (Lee et al., 2020). However, research has shown that the impact of various strategic planning systems on the development of sustainable urban road infrastructure can vary significantly (Hatefi, 2018; Yang et al., 2015). In light of these complexities, urban authorities must now establish effective strategic planning systems capable of not only addressing emerging issues but also transforming them into opportunities for innovation and investment (Olazabal & Gopegui, 2021). Loorbach (2010) underscores the necessity of profound societal changes and cultural shifts to overcome inertia associated with conventional infrastructure development. In recent years, transition management has gained prominence as a vital catalyst in promoting sustainable infrastructure systems worldwide (Bai & Krumdieck, 2020; Vähäkari et al., 2020). It is argued that transition management might play a moderating role in influencing the relationship between strategic planning systems and sustainable urban road infrastructure development.

Research underscores the importance of investment in urban road infrastructure as a driver of economic growth in developing nations (Saidi et al., 2018; Wang et al., 2020). In Uganda, urban road networks are recognized as vital for enhancing competitiveness, promoting economic development, and connecting isolated regions to facilitate overall growth (Schwab, 2016). Given their importance, Uganda's Vision 2040 sets the ambitious goal of establishing a more integrated, safe, efficient, and comfortable urban road network. The Strategic Implementation Plan (2015-2025) specifically focuses on implementing urban road infrastructure, considering that 70% of the country's non-agricultural GDP is generated in urban areas. The Local Governments Act (Cap.243) assigns urban authorities various functions, including the responsibility for developing road infrastructure. Consequently, Town councils have been engaged in planning and developing road infrastructure within their jurisdictions using diverse strategic planning systems. However, despite operating in the same environment, sustainable roads remain elusive among Town councils (GOU, 2017). As sustainability demands emerge, there is an urgent need for these councils to adapt rapidly. Therefore, understanding the effectiveness of transition management in each Town council becomes crucial for comprehending the varying sustainability outcomes in the pursuit of Uganda's Vision 2040. In light of the potential complementarity between strategic planning systems and transition manage-

ment in promoting sustainable urban road development, this paper aimed to investigate whether transition management acts as a mediating mechanism between strategic planning systems and sustainable road development outcomes.

2. Literature Review

The conceptualization of this investigation is guided by two theories that view an organization as a system of interconnected social and technical entities (Geels, 2002). The sociotechnical systems theory (Emery & Trist, 1960), emphasizes the systematic design of organizations and the need to address social, economic, environmental, and technical aspects as interdependent components of a complex system. Complementing this, the transition management theory (Rotmans, Kemp, & Loorbach, 2007), provides a framework for collaboration, learning, and innovation on solutions that consider the social, economic, and environmental dimensions of sustainable development. These theories view sustainable urban road infrastructure development as a result of social, economic, and technical pressures, acknowledging the importance of stakeholder demands and adherence to sets of management structures and processes.

2.1. Strategic Planning Systems

In the realm of strategic management literature, there exists a consensus on the definition of Strategic Planning Systems (SPS) (King, 1983; Namada et al., 2017). These systems encapsulate the comprehensive array of management structures and processes that organizations employ in their strategic planning endeavours. They underpin the very essence of strategic planning (Ramanujam & Venkatraman, 1987). Bryson & Alston (2011) characterize Strategic Planning Systems (SPS) as the amalgamation of formal and informal processes through which organizations formulate and actualize strategies. Meanwhile, Malecki (1980) defines Strategic Planning Systems (SPS) as mechanisms facilitating the coordination of organizational efforts and resource allocation toward desired outcomes. This paper adopts the definition proposed by King (1983) and Namada et al. (2017), denoting Strategic Planning Systems (SPS) as the management structures and processes established within organizations to facilitate strategic planning.

According to Namada (2020) and Ramanujam and Venkatraman (1987), the conceptualization of strategic planning systems comprises design-oriented and context-oriented elements. Design elements encompass the inputs and outcomes of the strategic planning process, including planning techniques, consideration of internal and external factors, and functional coverage and integration (Grynko & Yehorova, 2020; Namada, 2020). On the other hand, the contextual elements are associated with the planning context and vary in emphasis based on the level of environmental turbulence. These elements pertain to the resources available for planning (King, 1983) and the resistance to planning (Lenz & Lyles, 1981).

2.2. Transition Management

Transition management constitutes a governance structure focused on effectively managing and supervising profound transformational endeavours within complex and ever-changing systems (Frantzeskaki et al., 2018; Nevens, et al., 2013). Its participatory and reflective approach facilitates strategic and operational planning in cities, enabling the identification of change drivers and encouraging collaboration among stakeholders to develop strategic agendas. By co-creating transformative solutions, transition management plays a crucial role in addressing sustainability challenges (Hölscher & Frantzeskaki, 2020). A key aspect of this framework is empowering stakeholders to enhance their knowledge and implement new practices and technological changes based on the shared visions they have co-created (Kemp et al., 2007). In doing so, transition management supports the emergence of new ideas and the adoption of novel approaches, driving positive and transformative changes within the system.

Transition Management (TM) encompasses distinct stages as outlined by various scholars, forming a comprehensive process: setting the transition arena, exploring the transition agenda, actor mobilization and experimental actions, and monitoring and evaluation (Nevens & Roorda, 2014). The transition arena involves a participatory learning approach, allowing actors from diverse sectors to collectively define and reshape a social issue, fostering shared sustainability visions. The transition agenda phase involves exploring structural barriers through scenario generation, shedding light on actors' interests, plans, and strategies, accompanied by investment negotiations. In the realm of transition experiments, actors trial specific solutions to societal issues, assessing their suitability and effectiveness. This structured approach to Transition Management enables collaborative problem-solving and sustainable transformation (Wittmayer et al., 2014).

2.3. Sustainable Urban Road Infrastructure Development (SRID)

The scholarly discourse defines sustainable road infrastructure development as planning, building, operating, and maintaining urban roads with consideration for societal, economic, and environmental concerns (Ametepey et al., 2020). Its goal is to alleviate burdens and yield benefits, which in turn enhances public access to facilities, improves service delivery, and elevates community welfare. Furthermore, it plays a pivotal role in preserving and enhancing the environment, ultimately contributing to the advancement of global sustainable progress (Correia et al., 2016; Torres-Machi et al., 2017). Extensive research has been conducted on sustainability features used to assess sustainable urban road infrastructure implementation (Barfod, 2018; Friedrich, 2015). Researchers and institutions commonly agree on four key features, including socio-ecological integrity, resource maintenance and efficiency, livelihood security and opportunity, and climate change adaptation and resilience infrastructure (Suprayoga et al., 2020).

2.4. Strategic Planning Systems (SPS), Transition Management (TM) and Sustainable Urban Road Infrastructure Development (SRID)

In the ever-evolving field of strategic management, several studies highlight the crucial function of strategic planning systems (Namada et al., 2017). The design, evaluation, and execution of strategies are all part of the comprehensive function that these systems perform (King & Cleland, 1978; Steiner, 1979). According to (Ramanujam & Venkatraman, 1987), businesses that properly configure their strategic planning systems have greater alignment and adaptability, which leads to increased effectiveness over time. Furthermore, as (Ramanujam et al., 1986) emphasize, attaining the ideal configuration can eventually result in higher organisational performance. These revelations emphasize how strategic planning systems and organizational performance are related, notably in terms of economic or financial aspects. The influence of composite strategic planning systems on the construction of sustainable urban roads is, however, only indirectly explored in research. In earlier attempts, binary tests were generally used to evaluate certain systems' elements related to the construction of sustainable transportation infrastructure, with varying degrees of success (Wei et al., 2016; Hatefi, 2018).

Hadjidemetriou et al. (2021) and Ruiz & Guevara (2020) have both reported a positive relationship between the utilization of strategic planning tools and techniques and the advancement of sustainable transport infrastructure. Conversely, Blackmore et al. (2018) have found a contrasting negative connection in their research. While Akbari et al. (2019), Nwachukwu & Chládková (2019), and Riana et al. (2020) have established a strong and favourable association between strategic resources and organizational performance, their assessments predominantly centred on financial and economic dimensions. It is well-established that integrating functional areas is vital for crafting a coherent strategy (Camillus & Venkatraman, 1984). As a crucial component of strategic planning systems, functional coverage has been shown to exert diverse impacts on sustainable transport infrastructure development (Pojani & Stead, 2017; Beiler 2016). The varied results suggest a dearth of compelling evidence to establish a clear connection between individual components of strategic planning systems and the development of sustainable road infrastructure. Similarly, there's a lack of adequate evidence to establish a direct link between combined elements strategic planning systems and the advancement of sustainable road infrastructure. Alternatively, they might point to the deep-rooted challenges within existing public and governance structures, involving multiple actors with diverse interests and values (Giorgia et al., 2018). Surprisingly, the scholarly discourse highlights the growing body of literature on the application of transition management methodologies to promote sustainability in other urban infrastructure systems (Kenji et al., 2016).

Peterson et al. (2022) utilized the transition management framework to demonstrate a strategic shift towards a circular phosphorous use system in the US. Giorgia et al. (2018) conducted a case study exploring the application of transition management to enhance the sustainability of Water, Sanitation, and Hygiene

(WASH) services in informal settlements in Uganda and Ghana. Loorbach et al. (2013) conducted a case study examining the application of transition management in the Netherlands to promote sustainable energy systems. The study demonstrated that transition management played a significant role in advancing sustainable energy systems in the country. All these studies demonstrate that transition management is indispensable in promoting sustainability in certain urban infrastructure systems. This approach entails a collaborative process that involves multiple stakeholders and aims at achieving a shared vision of sustainability (Kemp et al., 2007; Loorbach et al., 2017). By incorporating long-term thinking and immediate action, transition management guides organizations towards more sustainable directions (Falcone, 2014). Moreover, strategic planning systems are fundamental in achieving organizational objectives and have a direct impact on strategy outcomes (Namada et al., 2017). Further empirical investigations in the context of urban road infrastructure, that incorporate transition management will probably provide a framework for effectively managing and guiding the strategic planning process of transforming traditional road infrastructure into sustainable alternatives. Does transition management have a mediating role in the relationship between strategic planning systems and the development of sustainable urban road infrastructure among Town councils in Uganda?

Drawing on previous literature, this paper identifies the key elements, established either theoretically or empirically. Figure 1 illustrates the study model, depicting the independent variable (strategic planning systems), the mediating variable (transition management), and the dependent variable (sustainable urban road infrastructure development), along with their proposed relationships.

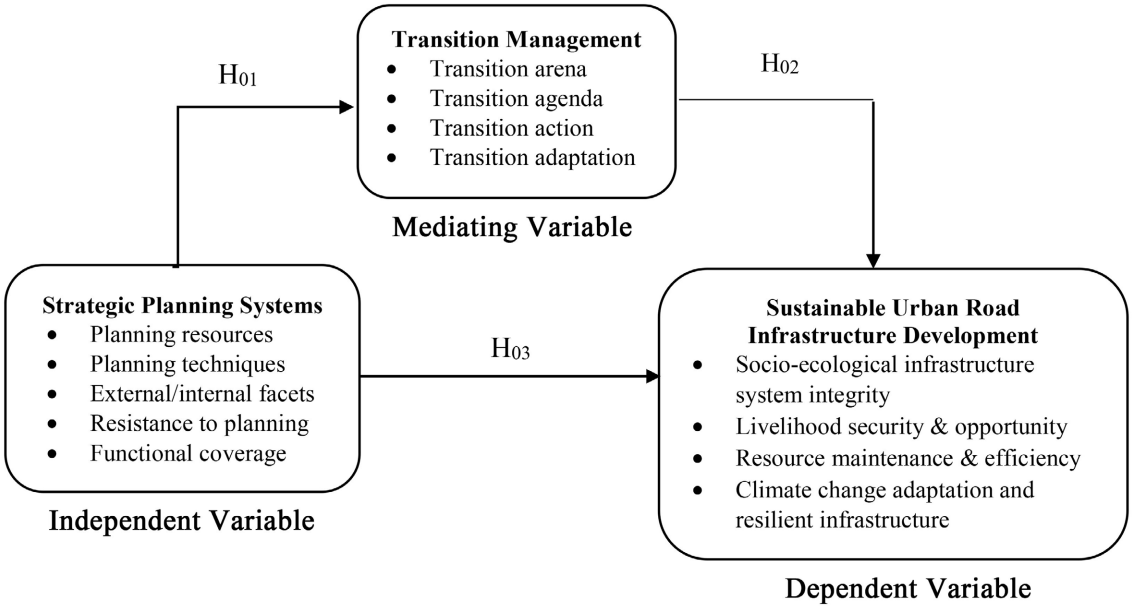

Figure 1. Conceptual Framework. Adopted by researcher.

To assess the relationships between the variables, the following null hypothesis and sub-hypothesis are formulated:

H_0 Transition management has no mediating role on the strategic planning systems - sustainable urban road infrastructure development linkage among Town councils in eastern and central Uganda.

H_{01} Strategic planning systems have no significant effect on transition management.

H_{02} Transition management has no significant effect on sustainable urban road infrastructure development among Town councils.

H_{03} Strategic Planning Systems have no effect on sustainable urban road infrastructure development among Town councils.

3. Methods

The study employed a descriptive cross-sectional survey design, collecting data from various Town councils in eastern and central Uganda at a single point in time. The calculation of an appropriate sample size is crucial in research design, as it directly impacts the reliability and relevance of the study's findings. In this study, which focused on all 244 Town councils in Uganda, Krejcie and Morgan's (1970) formula was used to determine the optimal sample size with a 95% confidence level. This approach aimed to enhance result accuracy. A conservative estimate of .5 was used to estimate the population proportion, resulting in a larger sample size for greater precision. By inputting these values into the formula, an estimation of the required sample size was obtained. This formula is essential for ensuring reliable research outcomes.

By plugging in the relevant values, the formula can provide an estimation of the required sample size to ensure reliable results. The formula is as indicated below:

$$n = X^2 Np(1-p) \big/ e^2 (N-1) + X^2 p(1-p)$$

In the given formula:

n = desired sample size.

N = Population size.

X = value of the chi-square table for the appropriate level of confidence with one degree of freedom (1.96).

e = degree of accuracy expressed as a proportion (.035).

p = estimated proportion in the target population possessing the characteristics being measured, typically assumed to be 50% or .5 based on Fisher (1993).

Substitute the values into the formula:

$$n = \frac{(1.96)^2 \times 244 \times 0.5(1-0.5)}{0.0352(244-1) + (1.96)^2 \times 0.5(1-0.5)}$$

Simplify the equation:

$$n = \frac{3.8416 \times 244 \times 0.25}{0.001225 \times 243 + 3.841 \times 0.25}$$

$$n = \frac{234.301}{1.257925}$$

$$n = 186.15$$

The study's data collection and analysis focused on 186 Town councils in eastern and central Uganda, selected from a total of 244, and entailed the administration of a questionnaire to a representative from the Technical Planning Committee. Diagnostic tests were conducted to examine the normality, linearity, multicollinearity, and homoscedasticity of the data, confirming its suitability for further regression analysis.

The study employed Cronbach's Alpha coefficients for reliability testing. These coefficients range from 0 to 1, with higher values indicating greater scale reliability. All the variables, including strategic planning systems (.834), transition management (.751), and sustainable urban road infrastructure development (.839), exhibited reliability. These Cronbach's Alpha values, ranging from .751 to .839, exceeded the recommended threshold of .70 (Nunnally, 1978). This confirms that all the variables are reliable and suitable for the study's analysis and interpretation.

To ensure the validity of the research, an extensive literature review was conducted to select appropriate measurement indicators. A pre-test of the survey tool was carried out with participants from 10 Town Councils to identify and rectify any design flaws, enhancing precision. The study also adopted and modified questions from previous research to improve criterion validity, drawing from studies by Namada et al. (2017) and Suprayoga et al. (2020). This comprehensive approach ensured the research's validity and precision.

To examine the mediating effect, the researchers utilized path analysis using the Hayes (2022) PROCESS version 4 for SPSS as represented in **Figure 2**.

Hypothesis H_{O2} was tested through pathway ***a*** (Model 1) TM = ß$_0$ + ß$_1$SPS + ε.

Hypothesis H_{O3} was tested through pathway ***b*** (Model 2) SRID = ß$_0$ + ß$_1$TM + ε.

Hypothesis H_{O1} was tested through pathway ***c′***(Model 3) SRID = ß$_0$ + ß$_1$SPS + ε.

Hypothesis H_O was tested through Model 4 SRID = ß$_0$ + ß$_1$SPS + ß$_2$TM + ε.

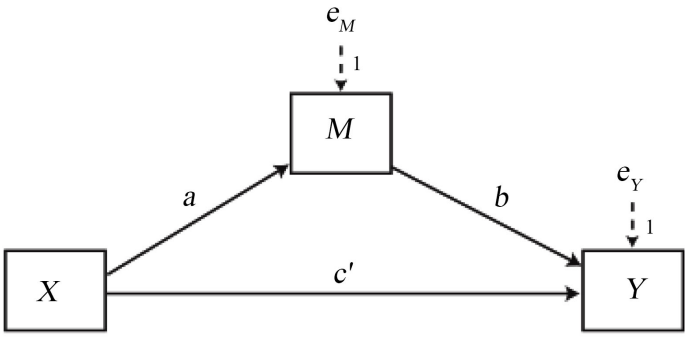

Figure 2. A statistical illustration of the mediation model.

4. Results

4.1. Descriptive Analysis

Table 1 presents the descriptive statistics of the study variables, including the number of items used to measure each variable, Cronbach's alpha (α) as a measure of internal consistency, the aggregate mean score, and the aggregate standard deviation.

The dimension among strategic planning systems with the highest mean was resistance to planning (mean = 3.13, SD = .572) and that with the lowest mean was use of planning techniques (mean 2.79, SD = .588). It indicates a moderate level of resistance to planning and use of planning resources. The dimension among transition management with the highest mean was transition arena (mean = 3.10, SD = .739) and that with the lowest mean was transition adaptation (mean 2.89, SD = .636). The dimension among sustainable urban road infrastructure development with the highest mean was resource maintenance and efficiency (mean = 3.50, SD = .445) and that with the lowest mean was Livelihood security and opportunity (mean 3.13, SD = .402).

Table 1. Descriptive statistics of the study variables.

		Mean	SD	Level	Cronbach's α	Interpretation
Independent variable	**Strategic Planning systems**					
	Planning resources	2.93	.612	Moderate	.939	Reliable
	Resistance to planning	3.13	.572	Moderate	.895	Reliable
	Consideration of internal facets	2.93	.745	Moderate	.840	Reliable
	Use of planning techniques	2.79	.588	Moderate	.848	Reliable
	Functional coverage & integration	2.89	.539	Moderate	.720	Reliable
	Consideration of external facets	3.00	.650	Moderate	.761	Reliable
Mediating variable	**Transition Management**					
	Transition Action	3.00	.602	Moderate	.767	Reliable
	Transition Arena	3.10	.739	Moderate	.718	Reliable
	Transition Agenda	2.99	.533	Moderate	.755	Reliable
	Transition Adaptation	2.89	.636	Moderate	.765	Reliable
Dependent variable	**Sustainable urban road infrastructure development**					
	Livelihood security and opportunity	3.13	.402	Moderate	.839	Reliable
	Socio-ecological infrastructure system integrity	3.13	.500	Moderate	.797	Reliable
	Climate change adaptation and resilient infrastructure	3.37	.618	Moderate	.886	Reliable
	Resource maintenance and efficiency	3.50	.445	High	.834	Reliable

4.2. Test of Hypothesis

The null hypothesis in this study posits that Transition management does not have a significant intervening/mediating role on the relationship between strategic planning systems and sustainable urban road infrastructure development among Town councils in Uganda.

The path analysis and summary statistics on the prediction of the independent variable (SPS) on the mediator variable (TM) is presented in Table 2. The prediction of the mediator variable from the independent variable must be significant to support mediation.

The R-value in Table 2, which is .678, indicates a positive and significant correlation between strategic planning systems and transition management. This suggests that an increase in strategic planning systems leads to an improvement in transition management. The model was statistically significant (F (1, 173) = 147.170, p = .000), and the R square value of .460 shows that 46% of the variation in transition management can be explained by strategic planning systems. The predictor variable, strategic planning systems have a coefficient of .653. The coefficient represents the estimated change in the outcome variable (Transition management) for a one-unit change in the predictor variable (SPS), while holding all other variables constant. In this case, for every one-unit increase in strategic planning systems, "transition management" is estimated to increase by .653. Since the p-value (.000) is less than .05, it can be concluded that the strategic planning systems are a significant predictor of transition management. In other words, there is strong evidence to suggest that strategic planning systems significantly affect transition management, and this association is not likely due to random chance. Therefore, hypothesis H_{01} is not supported.

In line with model 2 and model 3, the path analysis $\boldsymbol{b}$ between M (Transition Management, TM) and Y (sustainable urban road infrastructure development, SRID) and $\boldsymbol{c'}$ representing the pathway from Strategic Planning Systems (SPS) to Sustainable Urban Road Infrastructure Development (SURID) were conducted. This was done to generate the coefficients of these effects which are useful in determining the indirect and direct effects of the mediating variable. The prediction of the dependent variable from the mediator variable must be significant to support mediation. The findings are presented in Table 3.

Table 2. Path Analysis between strategic planning systems and transition management.

OUTCOME VARIABLE							
Transition Management							
Model Summary							
	R	**R-sq**	**MSE**	**F**	**df1**	**df2**	***p***
	.678	.460	.110	147.170	1.000	173.000	.000
Model							
	coeff	**se**	**t**	***p***	**LLCI**	**ULCI**	
constant	1.073	.160	6.692	.000	.757	1.390	
SPS	.653	.054	12.131	.000	.547	.579	

Table 3. Path analysis between transition management and sustainable road infrastructure development.

OUTCOME VARIABLE							
SRID							
Model Summary							
	R	**R-sq**	**MSE**	**F**	**df1**	**df2**	***p***
	.603	.363	.083	49.086	2.000	172.000	.000
Model							
	coeff	**se**	**t**	***p***	**LLCI**	**ULCI**	
constant	1.745	.156	11.1171	.000	1.437	2.054	
SPS	.287	.064	4.519	.000	.162	.413	
TM	.226	.066	3.418	.001	.095	.356	

The summary statistics reveal an R-value of .603, indicating a significant and positive correlation between Transition Management and sustainable urban road infrastructure development. This suggests that an improvement in Transition Management will lead to enhancements in the development of sustainable urban roads. The model itself is statistically significant (F (2, 172) = 49.086, p = .000), and the R square value of .363 indicates that 36.3% of the variation in sustainable urban road infrastructure development can be explained by Transition Management.

From the above regression analyses, it can be summarized that the path analysis between strategic planning systems and Transition Management showed a statistically significant relationship (a = .653, se = .054, p = .000). The results in Table 3 also indicate that Transition Management (TM) has a significant effect (b = .226, se = .066, p = .001) on sustainable urban road infrastructure development (SRID). This finding supports the second condition for mediation, suggesting that Transition Management serves as a mediating variable between strategic planning systems and sustainable urban road infrastructure development. The direct effect of strategic planning systems (SPS) and sustainable urban road infrastructure development (SRID) is also significant (c' = .287, se = .064, p = .000). Figure 3 shows a summary of the regression analyses from the three Models.

The final step as indicated in Table 4 shows the total effect model ($c = c' + ab$) of SPS (Strategic Planning Systems) on SRID (sustainable urban road infrastructure development). Thus,

The results in Table 4 show that strategic planning systems have a significant total effect (c = .435, se = .048, p = .000) on sustainable urban road infrastructure development. In addition, Table 5 shows the summary of the total, direct, and indirect effects of X (SPS) on Y (SRID).

Table 5 shows the different effects of X (strategic planning systems) on Y (sustainable urban road infrastructure development). The indirect effect of Strategic Planning Systems on sustainable urban road infrastructure development is significant and hence transition management mediates the relationship between

strategic planning systems and sustainable urban road infrastructure development among Town councils in Uganda. In addition, since the indirect effect and the direct effect are both significant, there existed a partial mediation. Thus, transition management partially mediates the relationship between strategic planning systems and sustainable urban road infrastructure development among Town councils in Uganda. The null hypothesis H_0 is therefore not supported.

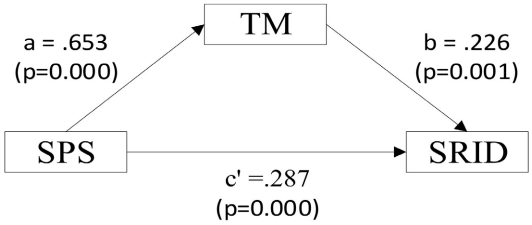

Figure 3. Mediation model.

Table 4. Total effect model of SPS on SRID.

OUTCOME VARIABLE							
Sustainable urban road infrastructure development							
Model Summary							
	R	**R-sq**	**MSE**	**F**	**df1**	**df2**	***p***
	.566	.320	.088	81.457	1.000	173.000	.000
Model							
	coeff	**se**	**t**	***p***	**LLCI**	**ULCI**	
constant	1.988	.143	13.852	.000	1.704	2.271	
SPS	.435	.048	9.025	.000	.340	.530	

Table 5. Total, Direct, and Indirect Effects of Strategic planning systems on sustainable urban road infrastructure development.

********TOTAL, DIRECT AND INDIRECT EFFECTS OF SPP ON SRID*******						
Total Effect of SPS on SRID						
	Effect	SE	t	p	LLCI	ULCI
	.435	.048	9.025	.000	.34	.53
Direct Effect of SPS on SRID						
	Effect	SE	t	p	LLCI	ULCI
	.287	.064	4.519	.000	.162	.413
Indirect effect(s) of SPS on SRID						
	Effect	Boot SE	Boot LLCI	Boot ULCI		
TM	.147	.045	.061	.239		

**********ANALYSIS OF NOTES AND ERRORS**********

Level of Confidence for all confidence intervals in output: 95.00000

Number of bootstrap samples for percentile bootstrap confidence intervals: 10000

--------END MATRIX-------

5. Discussions

The study explored the mediating role of transition management on the relationship between strategic planning systems and sustainable urban road infrastructure development among Town Councils in eastern and central Uganda. This objective was attained by testing the hypothesis below:

H_0 Transition management has no significant mediating effect on the relationship between Strategic planning systems sustainable urban road infrastructure development among Town councils in eastern and central Uganda.

Transition management refers to the processes and strategies used to manage change within an organization or system (Loorbach, 2010). It involves the use of strategic planning, policy development, and stakeholder engagement to facilitate a transition to a more sustainable future. In the context of the study, transition management was operationalized to mean the ways in which Town councils in Uganda managed the transition from their existing road infrastructure to more sustainable and efficient systems. Accordingly, transition management is conceptualized as a factor that can help to ensure that strategic planning systems are aligned with sustainable development goals and that collaborative stakeholder management that promotes learning and experimentation is facilitated in the planning and implementation process of road development.

The study's result, showing a significant and positive correlation (R-value = .603) between Transition Management (TM) and sustainable urban road infrastructure development (SRID), supports the notion that a well-implemented transition management approach positively influences the development of sustainable roads. The literature extensively discusses the significance of transition management as a driver of sustainability outcome in infrastructure systems (Peterson et al., 2022; Giorgia et al., 2018; Loorbach et al., 2013). This study's findings align with this perspective, as transition management was observed to have a positive and significant impact on sustainable urban road infrastructure development. As per the findings of Hölscher et al. (2019), it is evident that transition management plays a pivotal role in the formation of stakeholder networks and the facilitation of sustainability opportunities. These networks enable stakeholders to appreciate each other's interests and work collaboratively to identify appropriate sustainability solutions. The results also indicate that Town councils recognize the importance of stakeholder engagement and network formation, facilitating collaboration towards identifying suitable solutions. These findings reinforce the notion that stakeholders play diverse roles, including that of power brokers, coalition enablers, and manipulators of conflicting preferences and technology (Zahariadis, 2016). Therefore, it can be said that to ensure sustainability in road projects requires a transparent process that adequately represents the diverse interests of stakeholders (Bueno et al., 2015). According to Bond et al. (2013), stakeholder participation is critical for gathering inputs to support decision-making, disseminating information to a wider range of stakeholders, and reconfiguring power structures. Bond et al. (2013) further note that a commitment

to stakeholder participation guarantees inclusive decision-making processes and legitimate outcomes. In this context, the findings of this study support Fischer (1999) conclusion that adequate stakeholder participation is crucial to ensuring the integration of sustainability dimensions.

Moreover, the significant direct effect (a = .653, p = .000) of strategic planning systems on Transition Management further reinforces the importance of strategic planning systems in fostering transition processes. This suggests that effective strategic planning systems create an environment conducive to successful transition management. Consistent with prior research (Elbanna, 2010; Kemp et al., 2007), this study reveals that strategic planning systems serve as a precursor to transition management. Consequently, the study successfully posits and empirically supports the notion that organizations equipped with effective strategic planning systems are more adept at incorporating stakeholder perspectives into their present and future endeavours. This conclusion is likely attributable to the specific types of strategic planning systems examined in this study.

For example, previous studies have highlighted the significant role of strategic planning resources in fostering stakeholder participation (Afandi et al., 2018; Elbanna et al., 2016). Specifically, planning resources facilitate collaboration, co-creation, and the integration of multiple perspectives. The Resource Dependency Theory (Pfeffer & Salancik, 1978) proposes that organizations depend on external resources to achieve their objectives. Organizations with greater resources are better positioned to engage and involve stakeholders. These resources can include financial capital, skilled workforce, advanced technology, and access to information, all of which contribute to an organization's ability to interact and collaborate with stakeholders effectively.

Moreover, strategic planning tools offer a structured framework for decision-making during the transition process, aiding in objective identification, goal setting, and action planning (Meyerowitz et al., 2018). They keep decision-makers focused on the strategic direction and facilitate informed choices. Moreover, these tools align diverse stakeholders and teams, ensuring a shared vision and coordinated efforts (Elbanna, 2009). With a long-term perspective, strategic planning tools prevent short-sighted decisions and consider the transition's broader implications for the organization's future.

However, the finding that Transition Management (TM) has a significant effect (b = .226, p = .001) on sustainable urban road infrastructure development (SRID) supports partial mediation. This implies that while strategic planning systems directly influence Transition Management, Transition Management itself plays a significant role in shaping the development of sustainable urban road infrastructure, beyond the influence of strategic planning systems. This result further suggests that while strategic planning systems play a crucial role in guiding the development of sustainable urban road infrastructure, the successful implementation and realization of sustainability goals heavily rely on the effective application of transition management principles and practices.

Research exploring the same pathway as proposed in this study, specifically in urban road infrastructure systems, remains limited. However, there have been investigations conducted in other sectors that examine similar relationships. For example, Jenkins and Sovacool (2018) found that transition management fully mediated the linkage between strategic planning and transition to renewable energy systems. Transition management serves as an effective mediator because strategic planning components (like planning resources and tools) show positive links with both transition management and sustainable road infrastructure development. This alignment is reiterated in preceding sections of this study concerning transition management and sustainable urban road infrastructure development.

Having a successful strategy and effective strategic planning systems paves the way for Town councils to implement integrative planning and governance approaches for effectively managing and guiding the complex process of transforming conventional urban road infrastructure into sustainable alternatives. Thus, the main purpose of this study was to investigate the mediating role played by transition management in the link between strategic planning systems and sustainable urban road infrastructure development. The findings of this research revealed that the questionnaire used to measure the three variables demonstrated good qualities in terms of reliability and validity. The demographic profile of the respondents that participated in this study showed that the majority of the respondents were aged between 25 and less than 30 years old, have experience of 3-less than 6 years, and hold managerial positions.

In addition, the descriptive statistics showed the mean and standard deviation of each dimension and variable used in the questionnaire. The results showed that the respondents had positive attitudes towards all the variables used in this study. The results of conducting the path analysis showed that strategic planning systems had a significant effect on transition management. Furthermore, the results indicated that transition management did have a significant effect on sustainable urban road infrastructure development. Regarding the test for mediation, it was found that transition management did mediate the link between strategic planning systems and sustainable urban road infrastructure development but only partially.

6. Conclusions

The study presents a significant conclusion that strategic planning systems do not independently influence the development of sustainable urban road infrastructure. Instead, they exert their influence through the mechanism of transition management. This finding highlights the importance of a participatory and reflective approach in strategic and operational planning within urban authorities. By involving various stakeholders and encouraging collaboration, strategic planning systems become more effective in identifying change drivers and shaping strategic sustainability agendas.

Urban roads, being complex infrastructure systems, involve a wide array of actors, including road users, designers, workers, and policy makers. The study reveals that the Town councils surveyed have successfully established a framework that facilitates knowledge sharing among these diverse actors. This knowledge sharing fosters a collective effort in addressing societal challenges related to urban road infrastructure, encouraging the development of innovative solutions, and ultimately forming a shared vision for sustainable development in road projects.

The study's insights underscore the significance of considering the interconnections between different actors and the institutional context in which strategic planning takes place. It emphasizes the role of dialogue, collaboration, and shared visions in achieving sustainable outcomes in urban road infrastructure development. By embracing a multi-actor approach to discuss sustainability futures, urban authorities can navigate the complexities of road infrastructure development more effectively and advance their strategic planning efforts towards sustainable urban road projects.

7. Implications

The transition management theory proposes a framework for managing large-scale societal transitions, particularly transitions towards more sustainable and resilient societies. The theory emphasizes the importance of collaboration, experimentation, and learning in navigating these complex transitions. This study established a positive significant mediating effect of transition management on the relationship between strategic planning systems and sustainable urban road infrastructure development. This finding contributes to the transition management theory by highlighting the role of transition management in facilitating sustainable road infrastructure development. By emphasizing the importance of collaboration, experimentation, and learning in the planning and implementation of road infrastructure projects, this study aligns with the principles of transition management theory. Furthermore, this study suggests that strategic planning systems alone may not be sufficient to achieve sustainable road infrastructure development. Rather, transition management practices may be necessary to bridge the gap between strategic plans and on-the-ground implementation. This finding is consistent with the transition management theory's emphasis on the importance of experimenting with new approaches and learning from failures in order to achieve successful transitions.

8. Limitations

In interpreting the study's results, it's important to consider several methodological limitations. The mix of organizational respondents and varying urban characteristics might have influenced our chosen measures. Additionally, the Town councils, while all categorized as such, operated at different periods, potentially impacting the data collection context and result interpretation. The

operationalization of variables may not have been uniformly understood by respondents due to varying levels of experience. A lack of local literature supporting the constructs was also a limitation. Despite these limitations, we maintain that the study's results contribute significantly to the current understanding of strategic management.

9. Suggestions for Future Research

Future studies should consider more homogeneous samples, particularly regarding the mix of organizational respondents and the variation in urban characteristics. This can help in better understanding the specific effects of transition management on the relationship between strategic planning systems and infrastructure development. Secondly, given that the Town councils operated at different periods, conducting a longitudinal analysis could provide insights into how changes over time impact the relationship studied. This could involve tracking changes in strategic planning and transition management practices and their effects on infrastructure development. Lastly, future research should complement quantitative research with qualitative methods, such as interviews or focus groups, to provide a deeper understanding of the perceptions and experiences of the respondents. This can help in addressing issues related to variable operationalization and the understanding of concepts.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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