

From Transport Corridors to Industrial Corridors: Developing a Corridor Industrialisation Governance Framework (CIGF) for Africa

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ABSTRACT: *Transport corridors have now become essential to Africa's regional integration strategy, with strategic investments aiming to boost commerce, decrease logistics costs and drive industrialisation. While there is evidence that these expenditures have led to only minimal structural transformation, there have been significant increases in transport efficiency across numerous regional corridors. This study examines the governance conditions required to convert transport corridors into industrial corridors that can support sustainable manufacturing expansion and regional value chain development. The study, based on evidence from the Kazungula Bridge and the modernisation of the Beitbridge Border Post, uses a convergent mixed-methods design that combines quantitative survey data from 300 respondents and qualitative evidence from key informant interviews, focus group discussions and documentary analysis.*

The findings show that infrastructure investments significantly enhanced logistics performance and regional connectivity. However, fragmented governance, weak policy coordination, limited productive finance, inadequate enterprise support, and poor regional industrial integration constrained a wider industrial development. Based on these findings, the paper proposes the Corridor Industrialisation Governance Framework (CIGF), an integrated governance model that identifies institutional coordination, industrial policy alignment, enterprise development, productive finance and regional value chain integration as the key pillars of infrastructure-led industrialisation.

The framework contributes to the current body of research on corridor development by shifting the focus away from transport efficiency to governance structures that facilitate structural transformation. The study finds that transport infrastructure should be designed and managed as part of integrated industrial ecosystems rather than as discrete engineering projects. The suggested framework offers a workable governance architecture for governments, regional economic communities and development partners to maximize the developmental gains of key infrastructure investments.

KEYWORDS: *industrial corridors, industrial policy, infrastructure development, regional integration, structural transformation, and transport corridors.*

1. INTRODUCTION

Transport corridors are one of the fundamental aspects of contemporary African development strategy. Across the continent, governments have poured billions of dollars into roads, railways, bridges, ports, border infrastructure and logistics platforms hoping that better connectivity will boost regional integration, enable trade, attract investment and speed up industrialization (African Union, 2015; African Development Bank, 2024; World Bank, 2023). Agenda 2063, the African Continental Free Trade Area (AfCFTA) and the Programme for Infrastructure Development in Africa (PIDA) are some of the continental initiatives that have further reinforced such investments, recognizing transport infrastructure as a critical foundation for inclusive economic transformation and regional competitiveness.

Historically, the assessment of transport corridors has focused primarily on their operational performance. Success has been quantified in terms of reduced freight costs, quicker border clearance times, greater cargo volumes and enhanced logistical efficiency (Arvis et al., 2018; World Bank, 2023). While these markers are still relevant, they don't fully assess developmental impact. Efficient transport systems support the transportation of commodities, but do not necessarily translate into domestic production, technological upgrading, industry diversification or job creation.

Consequently, many African transport corridors have become more efficient in the movement of products across borders without significant changes in the productive structures of the countries they are linked to.

The disconnect reveals a key governance concern. Infrastructure projects are usually developed, financed, implemented and assessed as engineering or transport solutions, rather than as parts of wider industrial development programs. Corridor development is typically the responsibility of a wide variety of ministries such as transport ministries, customs authorities, trade agencies, investment promotion bodies and institutions related to industrial policy, with little coordination. This may lead to significant improvements in physical infrastructure, while supporting policies required for industrialisation, such as enterprise development, productive finance, innovation assistance, supplier development and regional value chain integration, are fragmented or underdeveloped.

The report contends that converting transport corridors into industrial corridors demands more than just more infrastructure investments. This demands a governance framework that can coordinate institutions, align policies, mobilise productive investment, encourage enterprise competitiveness, and integrate domestic firms into regional production systems. This paper proposes a new conceptual model, the Corridor Industrialisation Governance Framework (CIGF), which explains the impact of governance arrangements on the developmental outcomes of strategic transport infrastructure based on empirical evidence from the Kazungula Bridge and the Beitbridge Border Post. Instead of infrastructure being the final goal of development policy, the framework considers transport corridors as platforms around which industrial ecosystems can be intentionally built.

The work makes three key contributions to the literature. First, it moves the literature on corridor development beyond logistical performance to governance as the primary explanatory variable for industrial transformation.

Secondly, it creates the Corridor industrialization Governance Framework as an empirically-informed and theoretically based paradigm for infrastructure-led industrialization. Third, it makes policy recommendations to governments, regional economic communities and development finance institutions looking to maximize the long-term economic rewards of strategic infrastructure projects across Africa.

2. LITERATURE REVIEW

2.1 Transport Corridors as Instruments of Regional Development

The perception of transport corridors has changed from being physical transport links to multidimensional development platforms that support commerce, investment, regional integration and industrial transformation. In the past, corridor development has concentrated mostly on investment in roads, railroads, ports, bridges and border infrastructure to facilitate the transit of products. However, current development thinking recognizes that transport corridors have a much wider impact on economic outcomes, such as production systems, labour mobility, regional competitiveness, investment attraction and industrial clustering (Banomyong, 2008; Arnold, 2006; World Bank, 2023).

The strategic significance of transport corridors has been particularly highlighted in developing regions where high logistical costs continue to be a barrier to economic development. According to the World Bank (2023), inefficient transport infrastructures increase transaction costs, impair export competitiveness, discourage investment and weaken participation in global value chains. Infrastructure improvements in corridors minimize travel time, improve the reliability of the supply chain, expand market accessibility and improve the efficiency of regional trade networks (Arvis et al., 2018). Such improvements are particularly critical for landlocked nations like Zimbabwe and Zambia, where economic competitiveness depends greatly on effective access to regional and international markets.

The establishment of transport corridors has been a key feature of continental integration projects across Africa. Strategic transport infrastructure is acknowledged as a prerequisite for accelerating industrialization and regional economic integration by Agenda 2063, the African Continental Free Trade Area (AfCFTA) and the Programme for Infrastructure Development in Africa (PIDA) (African Union, 2015; African Union Development Agency [AUDA-NEPAD], 2021; UNECA, 2023). Investment in flagship projects such as the Kazungula Bridge, the North–South Corridor, the Lamu Port–South Sudan–Ethiopia Transport (LAPSSET) Corridor and the Central Corridor reflects a greater understanding of the importance of physical connectivity to Africa’s development agenda in the long term (AfDB, 2024).

Despite these efforts, the developmental success of several African corridors is inconsistent. Logistics efficiency has improved dramatically, but industry diversification, manufacturing competitiveness and domestic value addition have gained ground more gradually (UNIDO, 2024; OECD, 2024). This divergence means that infrastructure investment alone does not sufficiently explain the success of corridor growth.

2.2 From Transport Corridors to Economic Corridors

The concept of economic corridor was born out of the limitations of transport-centric development. Economic corridors differ from traditional transport corridors, which are mainly for the movement of people and goods, and integrate transport infrastructure with industrial development, investment promotion, urban development, logistics services and institutional coordination (Brunner, 2013; Asian Development Bank [ADB], 2014).

Economic corridors establish spatial contexts that induce enterprises to concentrate output, exploit economies of scale, strengthen supplier networks and participate in regional value chains. Therefore, successful corridor development involves investments in transport infrastructure, industrial parks, special economic zones, skills development, energy infrastructure, digital connectivity and governance institutions at the same time (ADB, 2014; World Bank, 2023).

Experiences in East and Southeast Asia show the usefulness of this integrated approach. China's integrated coastal development strategy has combined infrastructure investments, export processing zones, industrial clustering, targeted investment incentives and coordinated industrial policies to turn transport corridors into globally competitive manufacturing locations (Lin, 2012). Similarly, Vietnam linked logistics development with export-led industrialization to allow indigenous enterprises access to regional and global production networks (World Bank, 2023). These experiences show that effective corridors are not just transport systems but well-managed industrial ecosystems.

By contrast, several African transport corridors are still largely transit routes. Freight mobility has increased significantly, yet domestic enterprises often remain stuck in low-value operations while higher-value manufacturing happens elsewhere (UNCTAD, 2024). The pattern reveals a significant governance gap between transit planning and the execution of industrial strategy.

2.3 Governance and Infrastructure-Led Industrialisation

Governance is becoming an increasingly significant factor in determining the success of infrastructure.

Contemporary governance theory extends beyond public administration and relates to the institutional arrangements by which governments, business sector players, regional organisations, development partners and civil society manage complex development interventions (Pierre & Peters, 2020).

Infrastructure governance is a lot more than just project implementation." This involves strategic planning, institutional coordination, financial arrangements, regulatory control, stakeholder participation, policy consistency, accountability mechanisms and long-term maintenance systems (OECD, 2020). While technical success is common in infrastructure projects, economic success is often absent where these governing functions are inadequate.

Institutional economics offers a crucial theoretical basis for understanding these interactions. Acemoglu and

Robinson (2012) suggest that inclusive institutions promote investment, innovation and productive enterprise, but weak institutions tend to discourage long-term industrial development. Similarly, Rodrik (2016) argues that industrial change requires institutional capacities that allow governments to coordinate investment, correct market errors, and facilitate technical upgrading. These viewpoints imply that the quality of governance has a mediating role between investment in infrastructure and industrial outcomes.

There is recent African evidence in favor of this concept. The African Development Bank (2024) indicates that the finance gap is now mostly a governance difficulty, rather than a financing concern. fragmented institutional duties, inconsistent regulatory frameworks, inadequate maintenance systems and weak policy coordination continue to undermine the developmental impact of massive infrastructure expenditures across the continent.

2.4 Industrial Policy and Regional Value Chains

Industrial policy has re-emerged as a key element of current development strategy. This is in contrast to earlier market-oriented approaches that played down the role of the state but recent scholarship has recognised the critical role of governments to facilitate structural transformation through the strategic coordination, capability development, investment promotion and technological upgrading (Andreoni & Chang, 2019).

A key mechanism is the regional value chains, whereby transport corridors can lead to industrialisation. While efficient transport infrastructure reduces transportation costs and enhances connection, productive transformation only happens when enterprises become integrated into manufacturing networks with supplier development, technological learning and growing domestic value addition (UNIDO, 2024). Participation in regional value chains is thus dependent on much more than the quality of infrastructure. Competitive firms, harmonised standards, trained labour, innovation systems and supporting industrial policies are needed (OECD, 2024; UNCTAD, 2024).

This still remains a major challenge for many African economies. The corridor investments have enabled greater commerce, but exports are still heavily concentrated in primary commodities and there is limited local processing (UNECA 2023). Transport efficiency has therefore not always translated into industrial competitiveness or diversification of exports.

2.5 Literature Gap

The review identifies three major holes in the current scholarship. First, research on corridors remains mainly focused on transport efficiency, logistics performance and trade facilitation, with relatively little attention being paid to governance systems that impact industrial results (Arvis et al., 2018; World Bank, 2023). Second, although the economic corridor literature acknowledges the importance of industrial development, few studies offer integrated governance frameworks that explain how transport infrastructure should be aligned with industrial policy, enterprise development, productive finance and regional value chain integration. Third, the African corridor studies are still

mostly descriptive, focusing on operational success and offering no theoretical direction on institutional structures that could transform transport corridors into industrial corridors.

This article tackles these deficiencies by presenting an integrated governance model, the Corridor industrialization Governance Framework (CIGF), which puts institutional coordination at the core of infrastructure-led industrialization. In contrast to current corridor models which are focused on physical infrastructure or logistical efficiency, the CIGF conceptualizes transport corridors as governance ecosystems that require coordinated action across transport, commerce, industry, finance, investment and regional integration agencies. Thus, the framework contributes to current literature by offering a theoretical explanation and a practical governance architecture to the transformation of vital transport assets into platforms for sustainable economic development.

2.6 Limitations of The Existing Governance Models

The literature recognizes the significance of governance in infrastructure development but existing models of governance are insufficient to explain the transition of transport corridors to industrial corridors capable of sustaining structural transformation. Most common frameworks essentially view governance as a method to facilitate infrastructure delivery, with an emphasis on project implementation, regulatory monitoring, institutional efficiency or coordination of the public sector (OECD, 2020; Pierre & Peters, 2020). These views provide useful insights into the management of infrastructure but give only limited explanations of the effects of governance on the long-term development of industry.

Similarly, traditional transport corridor models continue to measure success mainly through operational measures such as freight volumes, border clearance times, transport costs and trade facilitation (Arvis et al., 2018; World Bank, 2023). While such measurements do reflect advances in logistical performance, they provide little theoretical advice as to the governance structures needed to turn improved connectivity into industrial growth, enterprise competitiveness, technological upgrading and structural transformation. As a result, many African transport corridors have become more efficient transit routes without becoming productive industrial ecosystems.

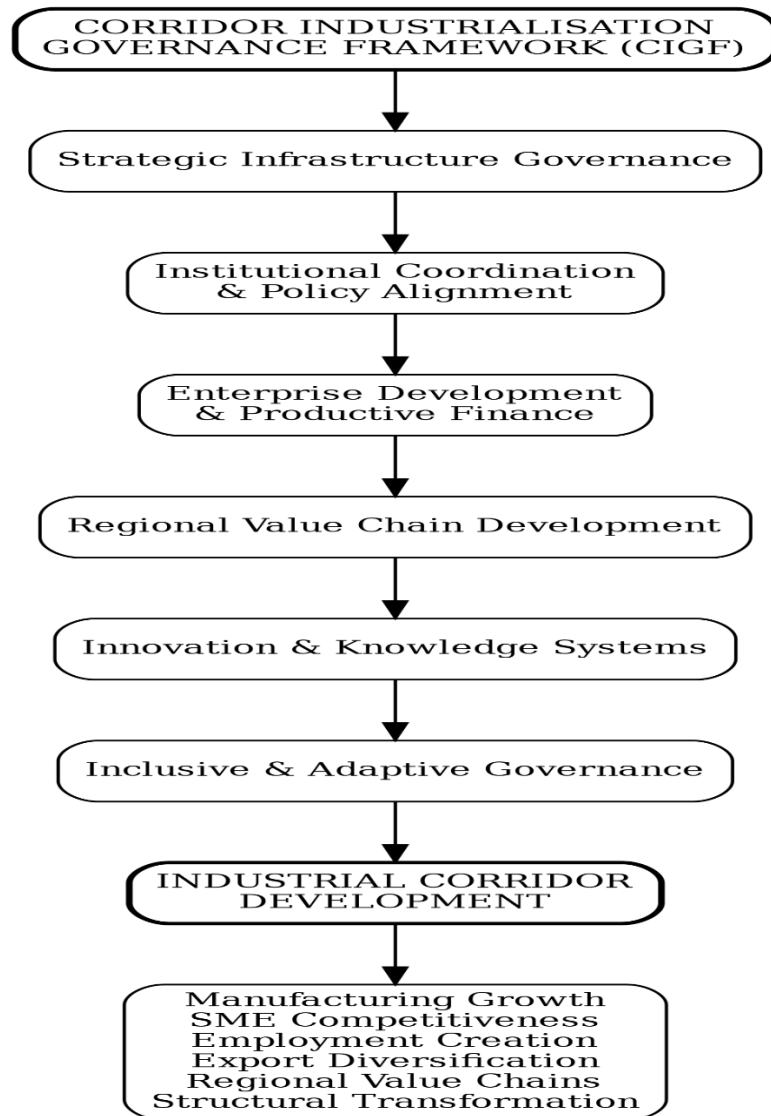
Existing economic corridor frameworks are a notable breakthrough in that they recognise the need to connect infrastructure with broader economic activity including industrial parks, investment promotion and urban development (ADB, 2014, Brunner, 2013). However, these models tend to account for the components of effective corridors instead of the governance mechanisms coordinating industrial policy, productive finance, company growth, innovation systems and regional value chain integration among

varied institutions. Governance is thus typically considered as a supporting variable rather than as the organising principle that determines whether transport infrastructure leads to sustainable industrialisation.

Moreover, governance study has typically distinguished institutional quality, regulatory efficacy, state capacity and public administration as discrete analytical areas (Pierre & Peters, 2020; Ostrom, 1990). Although these viewpoints have contributed greatly to the knowledge of public governance, they rarely combine the many institutional tasks for corridor-based industrialisation into a single conceptual framework. The research thus lacks an empirically grounded governance model understanding the relationship of strategic infrastructure governance, policy coordination, enterprise capabilities, productive financing, innovation systems and regional production networks.

The Corridor Industrialisation Governance Framework (CIGF) overcomes these weaknesses by placing governance at the core of the role of transport infrastructure in structural transformation. Rather than treating governance as an administrative support function, it views corridor development as an ecosystem of integrated governance comprising six mutually reinforcing pillars: strategic infrastructure governance; institutional coordination and policy alignment; enterprise development and productive finance; regional value chain development; innovation and knowledge systems; and inclusive adaptive governance. The CIGF combines these characteristics into one systems-based framework, builds on current theories of transport corridors, governance and industrial policy, and provides a realistic architecture for transforming transport corridors into competitive industrial corridors across Africa.

3. DEVELOPING THE CORRIDOR INDUSTRIALISATION GOVERNANCE FRAMEWORK (CIGF)



The proposed Corridor Industrialisation Governance Framework (CIGF) is depicted in Figure 1. The paradigm conceptualizes the development of industrial corridors as an integrated governance system, where six interdependent pillars jointly influence the extent to which transport infrastructure creates persistent structural transformation. The pillars of governance are interconnected and support each other towards the creation of an enabling environment for enterprise competitiveness, regional value chain integration, innovation and inclusive industrial growth.

Table 1 Governance Pillars and Institutional Responsibilities in the Corridor Industrialization Governance Framework (CIGF)

Governance Pillar	Lead Institutions	Core Functions	Expected Development Outcomes
Strategic Infrastructure Governance	Ministries of Transport, Infrastructure Agencies, Corridor Authorities	Corridor planning, infrastructure financing, maintenance, logistics coordination	Improved connectivity, reduced logistics costs, efficient freight movement
Institutional Coordination and Policy Alignment	Office of the President, Ministries of Industry, Trade, Finance, Investment Promotion Agencies	Policy harmonisation, inter-agency coordination, regulatory reform	Improved governance effectiveness, investment confidence, policy coherence
Enterprise Development and Productive Finance	Development Finance Institutions, Commercial Banks, SME Agencies, Industrial Development Corporations	Industrial financing, technology upgrading, business incubation, entrepreneurship support	Increased enterprise competitiveness, SME growth, industrial investment
Regional Value Chain Development	SADC, AfCFTA Secretariat, Export Promotion Agencies, Industry Associations	Supplier development, export promotion, industrial clustering, standards harmonisation	Greater domestic value addition, export diversification, regional manufacturing integration
Innovation and Knowledge Systems	Universities, Research Institutes, Technical Colleges, Innovation Hubs	Research and development, workforce training, technology transfer, digital innovation	Higher productivity, technological upgrading, industrial innovation
Inclusive and Adaptive Governance	Local Authorities, Civil Society, Private Sector, Community Organisations	Stakeholder engagement, environmental governance, monitoring and evaluation, adaptive policy learning	Inclusive development, institutional resilience, sustainable corridor management

Source: Developed by the author.

Table 1 operationalises the Corridor Industrialisation Governance Framework and identifies the main governance pillars, responsible institutions for execution, their primary functions and the intended development outcomes. The table suggests that the development of industrial corridors requires coordinated work across a number of sectors, rather than separate actions by the transport authorities alone. It also shows that success of governance depends on institutional cooperation in the process of corridor development.

3.1 Corridor Development Re-Evaluated

The research discussed above demonstrates that transport infrastructure alone cannot promote sustainable industrialisation. Investments in roads, bridges, railroads, ports and border infrastructure enhance connectivity and lower logistics costs, but they do not necessarily generate productive firms, competitive manufacturing industries or varied regional economies. Infrastructure, however, provides the physical conditions under which industrialisation can take place. The extent to which these prospects will translate into structural transformation will mainly depend on the quality of the governance of corridor development.

The focus in traditional corridor models has been on infrastructure provision, trade facilitation and logistics performance as key metrics of success (Brunner, 2013; World Bank, 2023). While these dimensions still matter, they only tell part of the story of corridor development, failing to capture the institutional frameworks needed to translate transport efficiency into industrial competitiveness. Thus, corridors should be seen as governance ecosystems where diverse public and private players coordinate investments, policies, institutions and production activities to foster long-term economic development, not just as transit networks.

Informed by this view, this article offers the Corridor Industrialisation Governance Framework (CIGF). The paradigm posits that industrial corridors are the product of coordinated governance not simply physical investment. Physical infrastructure is simply one pillar of a larger institutional architecture that links transport planning with industrial policy, enterprise growth, productive finance, regional integration and innovation systems.

3.2 The CIGF's Six Pillars

The proposed framework has six mutually reinforcing governance pillars that together decide whether transport corridors evolve into industrial corridors.

Pillar 1 – Strategic infrastructure governance

Infrastructure governance is not only about building projects, but also about long-term planning, maintenance, funding and performance management. Governments need to construct integrated corridor master plans that coordinate transport investments with national industrialisation policies, spatial development plans and regional economic development agendas. Strategic infrastructure governance also requires coordinated investment in complementary infrastructure, such as energy, digital connectivity, water supply, and logistics facilities, to ensure transport systems support productive economic activity rather than just facilitating transit (OECD, 2020; AfDB, 2024).

Pillar 2: Policy alignment and institutional coordination

Successful industrial corridors require clear institutional systems. Transport ministries, trade authorities, industrial development agencies, customs administrations, investment promotion bodies, local governments and regional organisations will function within coordinated governance structures to replace the fragmented sectoral mandates. Policy coherence lowers redundancy, enhances efficiency of execution, and offers a predictable climate for private investment. Empirical evidence from successful economic corridors suggests that institutional coordination is typically more important in determining industrial outcomes than the quality of infrastructure (Rodrik, 2016; Pierre & Peters, 2020).

Pillar 3: Productive Finance and Enterprise Development

Economic opportunities are only created by infrastructure if domestic firms have the capacity to utilize them. Corridor governance should consequently focus on enhancing enterprise competitiveness through access to cheap finance, technology upgrading, entrepreneurial development, business incubation, export promotion and workforce development. Targeted support is needed to help small and medium sized firms to be integrated in corridor-based production systems and to undertake higher value manufacturing activities. Productive financing should focus on long-term industrial investment rather than short-term commercial credit, allowing companies to upgrade their production technologies and increase their manufacturing capacity (Andreoni & Chang, 2019; UNIDO, 2024).

Pillar 4: Developing Regional Value Chains

Transport corridors must be manufacturing corridors, not only transit corridors. Governance structures should foster industrial clustering, supplier growth, cross-border manufacturing alliances, export diversification and regional sourcing strategies. Regional economic communities play a significant role in harmonizing standards, lowering non-tariff obstacles, coordinating industrial policies and promoting cross-border production networks. Such measures lead to increased domestic value addition and simultaneously improve regional competitiveness in continental and global markets (UNECA, 2023; UNCTAD, 2024).

Pillar 5: Innovation, technology and knowledge systems

Industrial competitiveness is increasingly reliant on the ability to innovate in the long run. Thus, corridor governance should foster cooperation between universities, research institutions, technical colleges, innovation hubs and private sector to speed up technology transfer and industrial modernization. Digital infrastructure, research and development, new manufacturing technologies and worker reskilling should be built into corridor planning right from the start. Investments of this kind allow enterprises to shift from labor-intensive production to knowledge-based manufacturing that can compete in more sophisticated regional and global value chains (OECD, 2024; World Bank, 2023).

Pillar 6: Adaptive and Inclusive Governance

Industrial corridor governance must be inclusive, transparent and adaptable to changing economic circumstances. Public participation, stakeholder consultation, environmental sustainability, gender inclusion, and community engagement are essential to the legitimacy and long-term efficacy of corridor development. Governments should

have adaptive governance tools in place, such as continuous monitoring, evidence-informed policy learning and institutional flexibility, to respond to technology development, market shocks, climatic risks and the changing dynamics of regional commerce. Successful corridors are not based on rigid administrative systems but require governance mechanisms that are able to change continuously and offer opportunities for collaborative issue solving (OECD, 2020; African Union, 2015).

3.3 Governance Dynamics in The CIGF

The Corridor Industrialisation Governance Framework views these six pillars as a system of governance rather than as distinct policy spheres. Any weakness in a pillar limits the efficiency of the whole framework. For example, world-class transport infrastructure cannot substitute for fragmented industrial policy, and competitive firms cannot thrive without reliable logistics and supportive regulatory environments. In addition, productive finance has little industrial influence when enterprises are isolated from regional value chains or do not have access to innovation platforms.

Thus, the framework challenges the conventional linear models of infrastructure-driven development. Instead, it takes a systems approach where the quality of governance influences the amount of productive transformation that physical infrastructure can provide. Industrial corridors are the result of interaction between institutions, firms, infrastructure, financing, innovation and regional cooperation and not only the investment in infrastructure.

3.4 Theoretical Implications

Previous corridor literature has tended to focus on engineering performance, logistical efficiency or trade facilitation. In contrast, the suggested paradigm uses institutional economics, industrial policy, regional integration and governance theory to construct a unified conceptual framework that explains how strategic infrastructure investments can be transformed into sustained structural transformation.

The CIGF sees governance as the missing institutional framework to transform transport corridors into industrial ecosystems, unlike traditional corridor models that conclude with better transport outcomes. The framework offers a theoretical explanation of corridor-based industrialisation and a practical blueprint for governance, which can be adapted by governments, regional economic communities and development finance institutions looking to maximise the developmental impact of infrastructure investment across Africa.

4. METHODOLOGY

4.1 Research Design

This study employed a convergent mixed-methods research methodology to analyze the governance processes via which critical transport infrastructure spurs industrial development in Southern Africa. We found a mixed-methods

approach acceptable as the research sought to explore both quantifiable correlations between infrastructure investment and industrial outcomes, and the institutional processes influencing those relationships. The study employed a mixed method approach to offer a thorough knowledge of the impact of governance arrangements on the transformation of transport corridors into industrial corridors (Creswell & Creswell, 2018; Tashakkori & Teddlie, 2021).

The empirical findings came from a larger doctorate study that examined the developmental consequences of the Kazungula Bridge and the modernization of the Beitbridge Border Post. Whereas the doctoral research focused on infrastructure development and industrialisation more generally, this paper reanalyses the dataset from a governance perspective, specifically on institutional coordination, industrial policy, enterprise development and regional value chain integration as determinants of corridor-based industrialisation.

4.2 Study Site and Participants

The study was carried out at two major transport corridors of Southern Africa, namely the Kazungula Bridge linking Zambia and Botswana and Beitbridge Border Post between Zimbabwe and South Africa. The two projects were selected because they are significant regional infrastructure investments aimed at improving trade facilitation, strengthening regional integration and stimulating industrial development (AfDB, 2022; SADC, 2022).

Quantitative data were collected from 300 respondents from government ministries, customs authorities, logistics organizations, manufacturing companies, small and medium enterprises (SMEs), financial institutions, regional organisations and development practitioners. The rationale behind the selection of these stakeholder groups is their direct involvement in infrastructure design, trade facilitation, industrial growth, and regional economic governance. Qualitative data were also collected from 25 key informant interviews and six focus group talks with top policymakers, industry leaders, customs officials, transport operators and regional development experts.

4.2.1 Participants and Sampling Procedure

Purposive stakeholder sampling was adopted to ensure representation from institutions involved directly in the development of transport infrastructure, trade facilitation, execution of industrial strategy, enterprise development, regional integration and investment promotion. Participants were chosen according to their professional duties and expertise relevant to the Kazungula Bridge and Beitbridge Border Post upgrading.

The quantitative element includes 300 respondents from government ministries, customs administrations, logistics corporations, manufacturing firms, small and medium enterprises (SMEs), financial institutions, regional organisations and development partners. The broad stakeholder composition helped to guarantee that the study captured multiple institutional views on corridor governance and industrialisation.

For the qualitative component, twenty-five key interviewees were purposively selected based on their strategic expertise of corridor planning, industrial policy, customs administration, manufacturing, logistics and regional economic integration. In addition, six focus group talks were held with members from government, industry and the

private sector to further study governance procedures, institutional coordination and enterprise experiences.

4.3 Data Collection And Analyses

Quantitative data were obtained through structured questionnaires on impressions of quality of infrastructure, effectiveness of institutions, competitiveness of enterprise, policy coordination and outcomes of industrial development. Descriptive and inferential statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS). Multiple regression analysis was used to investigate the relative impact of governance-related variables to industrial performance (Field, 2021; Hair et al., 2022).

Qualitative data was generated by using semi-structured interviews, focus group discussions and documentary analysis. Thematic analysis was used to evaluate the interview transcripts according to the methodology described by Braun and Clarke (2021). The themes of efficacy of governance, coordination among institutions, industrial policy, productive finance and regional integration were identified and triangulated using quantitative evidence. The credibility of the findings was enhanced by combining statistical connections with contextual explanations from stakeholder experiences (Fetters et al., 2013).

4.3.1 Development of Instruments, Reliability and Validity

The structured questionnaire was constructed after a thorough examination of the literature on transport corridor development, infrastructure governance, industrial policy and regional value chain integration. Items on the questionnaire were developed to capture the essential governance constructs of the Corridor Industrialisation Governance Framework (CIGF), namely, strategic infrastructure governance, institutional coordination, enterprise development, productive finance, innovation systems, and regional industrial integration.

Content validity was ensured by expert assessment by supervisors and academics with competence in infrastructure development, governance and industrial policy. Full data collection was preceded by minor editing for clarity, phrasing and contextual significance.

Cronbach's alpha coefficient was used to examine the internal consistency of the questionnaire. The overall reliability was higher than the widely acknowledged threshold of 0.70, indicating that the measurement scales had excellent internal consistency (Hair et al., 2022). These approaches increased the reliability and validity of the quantitative data.

4.3.2 Testing of Regression Assumptions

Before the estimation of the multiple regression model, diagnostic tests were conducted to check if the assumptions of multiple linear regression have been satisfied. Multicollinearity among the explanatory variables was checked using Variance Inflation Factors (VIF) and tolerance statistics. All predictor variables were within the typically established thresholds, suggesting that multicollinearity was not a major concern (Hair et al., 2022).

Normality of residuals was checked by normal probability (Q–Q) plots and residual distribution plots, which suggested residuals roughly followed a normal distribution. Homoscedasticity was examined by plotting standardised residuals against anticipated values, which indicated roughly constant variance over the observations. Independence of residuals was tested by Durbin-Watson statistic which showed no evidence of serial correlation in the regression errors.

These diagnostic approaches jointly demonstrated that the assumptions underlying multiple linear regression were sufficiently satisfied, giving us confidence in the robustness and stability of the computed regression coefficients.

Table 2. Regression Diagnostic Statistics

Diagnostic	Result	Recommended Threshold	Interpretation
Variance Inflation Factor (VIF)	All < 3.0	<5.0	No multicollinearity
Tolerance	All >0.30	>0.20	Acceptable
Normality of Residuals	Approximate normal distribution	Normal	Assumption satisfied
Homoscedasticity	Residual plots acceptable	Constant variance	Assumption satisfied
Durbin–Watson	≈2.0	1.5–2.5	Independent residuals

4.3.3 Regression Diagnostics

Before estimating the multiple regression model, diagnostic tests were performed to test if the assumptions of multiple linear regression were satisfied.

Multicollinearity was assessed using Variance Inflation Factors (VIF) and tolerance statistics. Normality of residuals was checked using normal probability plots and the Shapiro-Wilk test. Homoscedasticity was checked with the plots of standardised residuals versus the predicted values. The independence of residuals was tested with the Durbin–Watson statistic.

The diagnostic tests showed that the assumptions of multiple regression were sufficiently met, thereby confirming the robustness and reliability of the obtained regression coefficients.

4.3.4 Interview Procedures

Semi-structured interview guides were designed to maintain consistency between interviews but also to provide for enough flexibility for participants to discuss governance problems, institutional coordination, enterprise development, industrial policy implementation and regional value chain integration.

All interviews followed a uniform interview format, encompassing opening questions, thematic examination of governance arrangements, discussion of institutional constraints and potential and ending thoughts on policy recommendations. Interviews were recorded with participant's agreement, transcribed verbatim and analysed using theme analysis as indicated by Braun and Clarke (2021).

4.3.5 Ethical Issues

The entire investigation was performed under ethical norms. All participants provided informed consent prior to the start of data collection and participation was completely voluntary. Participants were told of the goal of the study and reassured that participation was voluntary and that they could withdraw at any stage without penalty.

To protect confidentiality and anonymity, identifying information was removed from transcripts and findings were reported in aggregate form. The data were securely maintained and utilized only for academic study in compliance with acknowledged research ethics principles.

4.4 Research Contribution

Instead of assessing infrastructure investments by typical measures such as freight volumes or border clearance times, this study looked at the governance factors shaping industrial outcomes. The approach integrated quantitative and qualitative evidence from many stakeholder groups, facilitating the development and empirical foundation of the Corridor Industrialisation Governance Framework (CIGF). The framework developed here goes beyond traditional infrastructure evaluation, showing how institutional coordination, policy coherence, enterprise capability, productive finance and regional value chain integration together influence the developmental impact of strategic transport investments.

5. RESULTS

Empirical evidence indicates that the Kazungula Bridge and renovation of the Beitbridge Border Post greatly enhanced transport efficiency and regional connections but were not sufficient to generate broad-based industry. Rather, governance considerations were largely determinant in whether infrastructure investments paid off in terms of productive economic consequences, the research reveals. The results are therefore provided along the lines of the six governance pillars backing the proposed Corridor Industrialisation Governance Framework (CIGF).

5.1 Governance of Strategic Infrastructure

The empirical results demonstrate that strategic transport infrastructure significantly improved logistics performance on the Kazungula and Beitbridge corridors. Improvements in border efficiency, reduced congestion, quicker clearing times and more predictable freight traffic following completion of the infrastructural upgrades were regularly mentioned by survey respondents. But the operational benefits have not been matched by similar advances in manufacturing expansion and industrial diversification. This shows that infrastructure performance is not sufficient to induce structural transformation. This wider paradox is evident across the thesis findings which indicate progress in mobility but chronically low industrial deepening.

This finding is further supported quantitatively by regression analysis. The biggest positive predictor of industrialisation was border efficiency ($\beta = 0.387$, $t = 4.21$, $p < .001$), suggesting that improved customs processes and border operations contribute to enhanced industrial performance. The entire regression model explained 61% of the variance in industrialization outcomes ($R^2 = 0.61$; $F = 19.8$; $p < .001$). The infrastructure-related factors had a statistically significant effect on industrial development. But the model also indicates that infrastructure alone cannot explain the remaining diversity, underscoring the role of complementary governance, financial and institutional elements.

Qualitative evidence supports the statistical results. Participants identified key operational gains at both border checkpoints, but frequently noted that efficiency of logistics had not translated into broad-based manufacturing growth. The first comment that came up again and again in the interviews was that better infrastructure had speeded up the transportation of products rather than increasing domestic productive capacity. The respondents said that industry competitiveness is hampered by low productive investment, fragmented governance systems, inadequate funding for enterprises, and weak industrial policy coordination.

The results corroborate the first pillar of the proposed Corridor Industrialisation Governance Framework by showing that strategic infrastructure governance creates the physical circumstances for industrial development but does not, in itself, lead to structural transformation. Instead, infrastructure should be seen as an enabling platform, whose expansion is only effective when complemented by governance structures that can transform logistical efficiency into productive industrial investment.

5.2 Policy Coherence and Institutional Coordination

Institutional coordination was said to be one of the most influential governance variables of corridor industrialisation. In the interviews and the focus group discussions, the fragmented responsibilities between transport authorities, customs administrations, industrial ministries, investment promotion agencies and regional

institutions were constantly mentioned by the interviewees. While each institution had legitimate sectoral aims, respondents observed that poor policy integration hampered the potential of governments to translate transit advances into coherent industrial development policies.

The quantitative results strongly confirm the perception. Policy coordination was positively and significantly related to industrialisation ($\beta = 0.301$, $t = 3.54$, $p = .001$), making it the second-best predictor in the regression model. These results imply that changes in government coordination significantly promote the contribution of transport infrastructure to industrial development. On the other hand, fragmented governance structures decrease the developmental benefits of infrastructure expenditures.

Interviewees regularly argued that transport infrastructure projects had been conducted more successfully than industrial policy reforms. Several stakeholders noted that the ministries responsible for transport, trade, finance and industry often operated in silos, which resulted in disjointed planning procedures and inconsistent policy execution. The respondents also stressed that corridor governance was still very much logistics performance oriented with relatively no emphasis on firm development, manufacturing competitiveness or regional industrial integration.

The combination of statistical and qualitative evidence reveals that governance coordination is a key mechanism linking infrastructure investment to economic change. The findings give strong empirical evidence for the second pillar of the Corridor Industrialisation Governance Framework that institutional coordination is the fundamental governance mechanism via which transport corridors grow into industrial corridors.

5.3 Development of Enterprise and Productive Finance

The data suggest that enhanced transportation infrastructure does not directly lead to increased firm development or industrial investment. The Kazungula Bridge and the modernisation of the Beitbridge Border Post reduced travel times, improved trade efficiency but many domestic enterprises still face financial, technological and institutional constraints that prevent them from benefiting from these improvements. Respondents repeatedly said infrastructure upgrades have made it easier to move commodities but have not done much to enhance the productive potential of local enterprises. Instead, corridor economies continue to be dominated by informal firms, low value activities and small-scale service operations with limited integration into formal manufacturing value chains.

These observations are consistent with the quantitative analysis. SME access was a statistically significant predictor of industrialisation ($\beta = 0.215$, $t = 3.36$, $p = .002$) which implies that the participation of enterprises has a beneficial effect on industrial growth even when the effects of infrastructure performance and governance characteristics are controlled for. The effect size, albeit smaller than that of border efficiency and policy coordination, shows the importance of boosting the availability of enterprises to productive possibilities as a key component of successful corridor development. The regression results thus show that the transport infrastructure generates more industrial advantages when it is combined with policies that enhance the competitiveness of enterprises and allow them to engage in the manufacturing activities.

Interviews and focus group discussions revealed that there were widespread concerns regarding limited access to affordable funding, outdated production technologies, lack industrial skills and excessive operating costs. Improved

border infrastructure minimized logistical delays, business representatives said, but the benefits were not enough to offset other structural restraints on the growth of enterprises. Access to long term industrial credit is limited and several respondents pointed out that this inhibits firms from increasing output, modernising equipment or engaging in higher value manufacturing operations. Others said many small and medium firms are still operating informally, constraining their capacity to benefit from export prospects generated by better regional connections.

The findings also show that productive finance remains an important missing connection between infra investment and industrial change. Improved logistics reduce transaction costs and improve market access. But enterprises need investment capital, technology upgrading, trained labor and supportive industrial policies to be able to efficiently take advantage of these new market opportunities. Infrastructural enhancements tend to generate more commerce, but not domestic production capacity, in the absence of these supplementary investments. This is why respondents have reported substantial gains in the transportation of freight, but little rise in manufacturing investment and formal employment.

The findings provide significant empirical evidence in favor of the third pillar of the Corridor Industrialisation Governance Framework. Hence, enterprise development should be considered a core governance role rather than a by-product of infrastructure investment. Governments should combine transit infrastructure with industrial financing mechanisms, enterprise incubation programmes, technology upgrading initiatives, export promotion plans and targeted support for small and medium firms. These initiatives would help local enterprises to be more active in corridor-based production systems and use the improved connectivity for sustainable industrial growth.

5.4 Building Regional Value Chains

The results show that while the Kazungula Bridge and the Beitbridge Border Post modernisation have significantly improved regional connectivity and eased cross border trade, these improvements have not translated into commensurate growth in regional manufacturing value chains. Respondents universally agreed that the improved transport infrastructure has boosted the volume and speed of freight transit and improved access to regional markets. But most of this increasing trade is still in manufactured items imported and unprocessed primary commodities, not anything manufactured in Zimbabwe or Zambia. As a consequence, the corridors have been more trade corridors than industrial corridors, limiting their contribution to structural reform.

The quantitative results support this conclusion. The regression model shows that though border efficiency has a significant impact on industrial performance ($\beta = 0.387$, $p < 0.001$), the magnitude of industrial development is primarily determined by the factors of complementary governance and enterprises, suggesting that improved logistics alone cannot achieve sustainable industrialization. The significance of policy coordination ($\beta = 0.301$, $p = .001$) further underlines the need for cohesive institutional frameworks to promote regional production systems, beyond trade facilitation. These findings indicate that transport infrastructure generates chances for participation in

regional value chains but needs coordinated industrial strategies to turn these opportunities into enhanced manufacturing activity and local value addition.

Qualitative information sheds lighter on these links. Government authorities, manufacturing firms, logistics operators and business associations have often highlighted the poor integration of local enterprises into regional production networks. This was attributed to restricted supplier development initiatives, inconsistent product standards, weak industrial clustering and insufficient collaboration among surrounding nations in creating regional manufacturing industries. Several delegates commented that although transport costs have fallen and market access has improved, local enterprises generally lack the production capacity, technological aptitude and quality certification to compete effectively in regional supply chains. The resulting higher connection has so helped to boost commerce but not the domestic industrial output to a same extent.

Participants also noted that corridor development has been centered mostly on physical infrastructure, with very little attention to developing productive links between enterprises. Industrial parks, supplier development programmes, export preparedness programmes and cross border manufacturing alliances remain largely underdeveloped. As a result, value addition possibilities continue to be captured outside the corridor economies with Zimbabwe and Zambia mostly dependent on exporting raw materials and importing higher value manufactured products. The mismatch restricts job development, technological learning and industrial diversification, even as transit efficiency improves.

Thus, the results confirm the fourth pillar of the Corridor Industrialisation Governance Framework by showing that the integration of regional value chains is a relevant governance function and not a natural outcome of better connectivity. Governments should also adopt coordinated industrial strategies to complement infrastructure expenditures, which can boost supplier development, industrial clustering, export diversification, standards harmonisation and cross border manufacturing collaboration. Regional economic communities such as the Southern African Development Community (SADC) and African Continental Free Trade Area (AfCFTA) need to strengthen mechanisms for regional production networks and enhanced participation of domestic enterprises in higher value manufacturing activities. Such coordinated interventions can convert transport corridors from transit routes to productive industrial ecosystems that create sustainable regional competitiveness and structural transformation.

5.5 Knowledge and Innovation Systems

Innovation and knowledge systems are among the least developed characteristics of corridor industrialisation, the studies show, despite their growing importance for long-term competitiveness. Respondents agreed that the Kazungula Bridge and the upgrading of the Beitbridge Border Post had led to a significant improvement in physical

connectivity, but consistently argued that limited investment in research, technology, innovation and human capital limited the capacity of domestic enterprises to leverage these new opportunities. Infrastructure improvements helped with logistics, but didn't necessarily increase technological capabilities, productivity or industrial innovation. As a result, many enterprises continued to operate with relatively low levels of technology that limited their ability to compete in regional and worldwide manufacturing markets.

The quantitative results give indirect evidence for this link. We found that border efficiency ($\beta = 0.387$, $p < .001$), policy coordination ($\beta = 0.301$, $p = .001$) and SME participation ($\beta = 0.215$, $p = .002$) were statistically significant predictors of industrialisation. The overall regression model explained 61% of the variation in observed industrial outcomes ($R^2 = 0.61$). The remaining unexplained variation suggests that other structural determinants of industrial performance, such as innovation capacity, technological readiness, workforce skills and institutional learning, still matter beyond the infrastructure and governance variables included in the model. These findings support the premise that infrastructure generates potential for industrial development, but this must be matched with investments in innovation systems if long-term structural transformation is to be realized.

Interview evidence further confirms the inadequate connection between infrastructure development and national innovation systems. Respondents said that there was limited collaboration between universities, technical colleges, research institutes, industry associations and manufacturing enterprises. Technology transfer, industrial research and workforce development opportunities were underused and the transfer of research results to commercial production was unusual. Some participants noted that infrastructure planning was frequently focused on building and operating efficiency, with less emphasis on increasing research and development, industrial innovation, or digital transformation. Thus, many firms lacked the technological capacity to raise productivity or participate effectively in higher-value industrial activities.

Participants also underscored the necessity of developing human resources for sustained industrial competitiveness. The development of enhanced transport infrastructure helped to open up access to regional markets, but shortages of specialized technical skills, engineering experience, innovation management and advanced manufacturing capabilities still held back industrial progress. The respondents said that without a coordinated investment in education, vocational training and applied industrial research, infrastructure improvements would continue to favor trade expansion rather than industrial upgrading. This result is consistent with the broader literature which sees innovation ecosystems as important drivers of productivity development and economic diversification in emerging economies.

Together, these results provide empirical evidence for the fifth pillar of the Corridor Industrialisation Governance Framework which designates innovation and knowledge systems as key pillars of infrastructure-led industrialisation.

The findings underscore the need for governments to think beyond transport infrastructure as a physical investment and to include research institutes, universities, innovation hubs, technical training centres and private sector in corridor development projects. Strengthening these knowledge ecosystems will enhance technology transfer, speed industrial upgrading, increase enterprise productivity and assist the shift from transport corridors to competitive industrial corridors that can support long-term structural transformation.

5.6 Inclusive and Adaptive Governance

The findings suggest that inclusive and adaptable governance is crucial for ensuring that the advantages of transport infrastructure transcend beyond enhanced logistics to broader socio-economic transformation. Respondents agreed that the Kazungula Bridge and the renovated Beitbridge Border Post were planned through stakeholder consultation processes, however many said that the participation was far less during the post-construction phase. This left little room for further cooperation between government agencies, the commercial sector, local communities, civil society organisations and regional institutions. This limited the potential of corridor governance institutions to respond effectively to developing industry issues and changing economic realities.

The quantitative results further highlight the necessity of flexible governance. The regression model revealed that border efficiency ($\beta = 0.387$, $p < .001$), policy coordination ($\beta = 0.301$, $p = .001$) and SME participation ($\beta = 0.215$, $p = 0.002$) significantly affected industrialisation outcomes. However, the model explained 61% variation in industrial performance ($R^2 = .61$). This suggests that about 40 percent of industrial development is explained by other contextual and institutional factors beyond that of infrastructure variables alone. Adaptive governance, with its emphasis on institutional learning, stakeholder participation, policy flexibility and collaborative decision making, thus, offers a significant vehicle for addressing these dynamic effects and improving long-term corridor performance.

Qualitative evidence suggested a broad consensus that corridor governance should shift from infrastructure management to integrated economic governance. Respondents noted that many decision-making processes remained excessively centralised, with little chances for local authorities, private firms, research institutes and communities to contribute to continuing corridor management. Some interviewees suggested that better policy responsiveness, faster industry investment and greater accountability would be achieved through closer cooperation between governmental institutions and the business sector. Others noted that larger community involvement will lead to better environmental sustainability, social inclusion and local economic growth thus ensuring infrastructure expenditures will lead to more equal development results.

Participants also noted that transport corridors operate in fast-changing economic environments, with technological innovation, changing regional trade agreements, climate-related concerns, geopolitical unpredictability and changing

investment patterns. Under these circumstances, governance systems based on bureaucratic rigidities are unlikely to preserve long-term industrial competitiveness. Rather, the respondents supported governance frameworks that would be able to continuously monitor, adapt policies to evidence, learn institutionally and regularly engage stakeholders. These adaptive governance systems were deemed vital to sustain corridor competitiveness and at the same time respond effectively to developing regional and global problems.

These findings offer empirical evidence for the sixth pillar of the Corridor Industrialisation Governance Framework which conceptualizes inclusive and adaptive governance as the institutional mechanism that keeps the other governance pillars effective over time. Strategic infrastructure, coordinated institutions, enterprise development, regional value chain integration and innovation systems are unlikely to reach their full development potential unless supported by governance arrangements that are transparent, participatory, accountable and capable of continuous adaptation. The findings thus points to industrial corridor governance as a dynamic process of collaborative learning rather than a static administrative structure.

5.7 Synthesis of The Findings

The combined quantitative and qualitative findings give strong empirical support for the proposed Corridor Industrialisation Governance Framework (CIGF). The statistical research shows that the strategic infrastructure upgrades, especially in terms of border efficiency, have a major effect on industrial development. The regression model, however, also reveals that the infrastructure itself does not explain industrial change. This points to the significance of supplementary governance mechanisms such as the coordination of policies and engagement of enterprises. Qualitative evidence continues to reinforce this conclusion, with respondents emphasising that fragmented institutions, weak productive finance, limited innovation capacity, inadequate regional value chain integration and insufficient stakeholder coordination continue to constrain the industrial returns generated from major infrastructure investments.

The convergence of qualitative and quantitative evidence suggests that, rather than a standalone end, development of transport infrastructure should be part of a larger governing ecosystem. The results demonstrate that the six governance pillars – strategic infrastructure governance, institutional coordination, enterprise development and productive finance, regional value chain development, innovation and knowledge systems and inclusive adaptive governance – are functioning as an integrated system, with a weakness in any one of the pillars undermining the effectiveness of the other pillars. This systems view explains why the study corridors have not seen similar levels of industrial diversification or expansion of manufacturing despite significant improvements in logistical performance.

Thus, the findings confirm the key claim of the Corridor Industrialisation Governance Framework that the success of

industrial corridor development relies not only on investment in infrastructure but also on coordinated governance. The study, which presents statistical evidence together with stakeholder experiences, highlights the importance of governance quality as the key mechanism to convert transit corridors into viable industrial ecosystems. This integrated interpretation offers the empirical basis for the subsequent theoretical debate, and presents the CIGF as an evidence-based conceptual framework and an actionable governance model for infrastructure-led industrialisation in Africa.

6. DISCUSSIONS

The results show that transport infrastructure is a necessary requirement but not a sufficient condition for sustained industrialisation. While the Kazungula Bridge and the modernisation of the Beitbridge Border Post have resulted in significant improvements in logistics efficiency, border management and regional connectivity, these operational gains have not been matched by equivalent gains in terms of manufacturing expansion or structural transformation. This finding is supported by the quantitative study.

The largest predictor of industrialisation was border efficiency ($\beta = 0.387$, $p < .001$), while policy coordination ($\beta = 0.301$, $p = .001$) and SME engagement ($\beta = 0.215$, $p = .002$) also made significant positive contributions. The model explained 61% of the variation in industrialisation outcomes ($R^2 = 0.61$). This indicates that infrastructure performance is important, but governance and enterprise capabilities are critical determinants of the extent to which infrastructure investments trigger productive economic transformation.

These results support and enhance existing theories of infrastructure-led development. It has been a commonplace assumption of development thinking that better transport infrastructure promotes industrial development, because it reduces transaction costs and improves market access.

This assumption is partly confirmed by the strong correlation between border efficiency and industrialisation seen in the present analysis. However, the results indicate that enhanced logistics cannot account for continuing structural change. The impact of transport infrastructure on development is channeled through institutional coordination, enterprise capabilities, productive finance, innovation systems and regional industrial integration. This interpretation is in line with arguments made by Rodrik (2016), Andreoni and Chang (2019) and UNIDO (2024) that industrialisation depends on coordinated institutional arrangements that enable enterprises to take advantage of the market opportunities offered by improved infrastructure.

The present study is an important addition to empirically confirm that governance is the main mechanism relating transport infrastructure to industrial development. While the relevance of institutional quality has been acknowledged in prior research, few have empirically investigated governance as an integrated system in transport corridor development. Using a mix of quantitative regression analysis and qualitative evidence with policy makers, customs officials, logistics operators, manufacturers and development practitioners, this study finds that fragmented

governance is a major constraint on the industrial payoffs from strategic infrastructure investments. All respondents observed that transport infrastructure upgrades were more successfully realized than complementary industrial initiatives, which resulted in better facilitation of trade but no corresponding increase in manufacturing competitiveness or domestic value creation.

The findings thus corroborate the basic claim of the Corridor Industrialisation Governance Framework (CIGF), that transport corridors should be seen as governance ecosystems, not engineering initiatives. In this ecosystem, strategic infrastructure governance provides the physical platform for development; institutional coordination aligns public policies; enterprise development strengthens productive capacity; regional value chains expand manufacturing opportunities; innovation systems enhance competitiveness; and inclusive governance ensures long-term institutional resilience. The statistical significance of governance related variables in the regression model provides empirical validation for this systems perspective. This suggests that development of industrial corridors depends on the interaction of multiple governance functions, rather than infrastructure investment alone.

These findings also help explain why equivalent physical infrastructure in transport corridors often delivers rather varied industrial outcomes. Those that integrate transport investment with coherent industrial strategy, effective institutional coordination, productive finance and innovation ecosystems are more likely to succeed in persistent structural transformation than those that rely exclusively on infrastructure expansion. Therefore, the study shifts the focus of corridor development from engineering performance to governance effectiveness, arguing that infrastructure creates development opportunities, and governance determines whether these development opportunities are translated into industrial competitiveness and long-term economic growth.

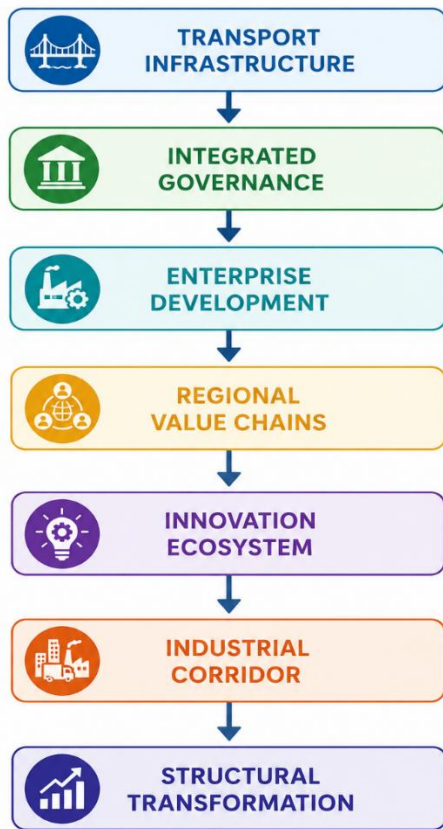
Table 3 Corridor Governance Maturity Matrix

Governance Dimension	Emerging	Developing	Integrated	Transformative
Infrastructure Planning	Project-focused	Corridor planning	Integrated spatial planning	Fully industrial ecosystem planning
Institutional Coordination	Fragmented ministries	Occasional collaboration	Permanent coordination mechanisms	Unified corridor governance authority
Industrial Policy	Separate from infrastructure	Partial alignment	Coordinated industrial strategy	Fully integrated industrial corridor strategy

Enterprise Support	Limited SME programmes	Basic business support	Technology and finance programmes	Globally competitive industrial ecosystem
Regional Integration	Trade facilitation	Customs harmonisation	Regional supplier networks	Integrated regional value chains
Innovation Systems	Minimal R&D	Isolated innovation initiatives	Coordinated research partnerships	Innovation-driven industrial ecosystem
Monitoring and Evaluation	Transport indicators only	Logistics and trade indicators	Economic performance indicators	Industrial transformation indicators

Source: Developed by the author.

Table 3 shows a practical diagnostic tool, using the Corridor Industrialisation Governance Framework. The matrix shows the various stages of governance maturity to allow policymakers to assess the institutional readiness of transport corridors for industrial transformation. The methodology encourages governments to analyze governance quality, enterprise competency, regional integration, innovation capacity, and policy coordination as indicators of corridor development, not just infrastructure performance.



Source-Developed by the author from empirical findings and the suggested Corridor Industrialisation Governance Framework (CIGF).

Figure 2. Governance Pathway from Transport Infrastructure to Structural Transformation

Figure 2 shows the governance process of how transport infrastructure contributes to sustainable industrialisation. The pathway demonstrates that transport infrastructure is the base layer investment upon which succeeding layers of growth are constructed. But infrastructure alone will not deliver structural transformation. Its developmental impact depends on the development of integrated governance systems that coordinate institutional players to harmonize public policies and create an enabling environment for productive investment. Good governance can thus enhance corporate development through better access to capital, technology, business support services and industrial capabilities.

As enterprises grow more competitive, they are better positioned to engage in regional value chains that lead to higher domestic value addition, export diversification and cross-border industrial collaboration. Continued investment in innovation ecosystems – R&D, technology upgrading, digital transformation and workforce skills – further boosts industrial productivity and competitiveness. These complementary processes form the basis for the

formation of industrial corridors that are not only transit corridors but integrated production and innovation hubs. Ultimately, sustainable structural transformation is attained through increasing manufacturing value addition, technological innovation, job creation, greater regional competitiveness and inclusive economic development. The governance pathway validates the basic assumption of this study that industrial corridor development is essentially a governance challenge rather than just an infrastructure challenge. It contributes to the Corridor Industrialisation Governance Framework by highlighting the process by which coordinated governance translates transit investments into long-term industrial and economic development.

6.1 Theoretical Contributions

This paper presents three interrelated theoretical contributions to the literature on transport corridor development, infrastructure governance and industrial policy. The function of transport infrastructure in supporting trade and regional connections has been well established in prior research, but few studies have explored the governance processes that enable infrastructure investments to foster sustainable industrialisation. This gap is addressed in the current study through the development and empirical validation of the Corridor Industrialisation Governance Framework (CIGF), a governance-oriented model that reconceptualises transport corridors as interconnected industrial ecosystems, rather than physical transport networks.

The first contribution is to extend transport corridor theory. Most of the existing corridor models have concentrated on physical infrastructure, logistical efficiency, freight movement and trade facilitation as the primary metrics of corridor performance (Brunner, 2013; Arvis et al., 2018; World Bank, 2023). While these viewpoints have contributed greatly to the knowledge of transport systems, they only partly explain the industrial transformation potential of some corridors, and the transit function of others. The findings of this research suggest that infrastructure performance alone cannot account for industrial outcomes. Instead, the statistically significant correlations between border efficiency, policy coordination, enterprise engagement, and industrialisation suggest that governance quality mediates the relationship between transport infrastructure and structural transformation. The CIGF thus expands on traditional corridor theory by establishing governance as the key organising factor through which transit investments induce long-term industrial development.

The second contribution is to governance theory by giving an integrated systems perspective to infrastructure-led growth. Governance has been studied traditionally in terms of efficacy of institutions, public administration, quality of regulation or state capability. While these techniques offer useful insights, they tend to analyze governance institutions in isolation rather than as elements of larger development systems that mutually reinforce each other (OECD, 2020; Pierre & Peters, 2020). CIGF views governance as an ecosystem of six interlinked and complementary pillars: strategic infrastructure governance; institutional coordination and policy alignment; enterprise development and productive finance; regional value chain development; innovation and knowledge systems; and inclusive adaptive governance. The analysis indicates that these dimensions of governance are dynamically interrelated and that the fragility of one pillar weakens the efficiency of the others. This systems

perspective offers a more complete theoretical explanation of the disparate industrial outcomes associated with substantial infrastructure investments in developing economies.

The third contribution adds to the theory of industrial strategy by incorporating transport infrastructure into current models of structural change. There is growing recognition in the industrial policy academia that industrialisation depends on coordinated investments in productive capacity, technological upgrading, company development and institutional quality (Rodrik, 2016; Andreoni & Chang, 2019; Lin, 2012). But transport infrastructure has frequently been viewed as a supporting input to industrial policy rather than as an intrinsic part of it. The outcomes of this study imply that infrastructure should be conceptualised as the underlying platform upon which industrial policy is operationalised. Strategic transport investments generate opportunities for production, investment and regional integration, but these opportunities become sustainable industrialisation only when they are supported by coherent governance arrangements, productive finance, innovation systems, and enterprise capability development.

In this sense, the CIGF offers a theoretical connection between the economics of infrastructure and industrial policy by demonstrating the interaction between physical connectivity and institutional coordination in influencing structural transformation.

Besides these concrete contributions, the study provides a broader conceptual change in the understanding of infrastructure-led development. Instead of considering transport infrastructure as an important driver of industrialisation, the framework considers infrastructure as an enabling asset, whose developmental influence depends on the quality of governance. This distinction is highly relevant for future research, because it encourages scholars to think about infrastructure projects in terms of wider institutional and economic systems, rather than in terms of engineering or logistics performance measures alone. It also provides a theoretical underpinning for comparative work on the reasons why comparable transport investments result in varied industrial outcomes in different countries and areas.

These contributions together represent a theoretical breakthrough and an empirically grounded model of the Corridor Industrialisation Governance Framework for understanding infrastructure-led industrialisation. The framework offers a comprehensive understanding of the process of transforming transport corridors into industrial corridors that can support sustainable structural transformation drawing on insights from transport studies, governance scholarship, institutional economics, industrial policy and regional development. Future study should review, refine and extend this paradigm in diverse geographical situations to evaluate its broader application and explanatory potential.

6.2 Framing the Findings Vis-À-Vis Alternative Perspectives

The findings of this study are broadly consistent with contemporary institutional policy and industrial policy scholarship, but they also challenge a long held assumption in infrastructure-led development theory that improvements in transport infrastructure automatically lead to industrialisation through reduced transaction costs and improved market access. In general, classical development theories and many studies in transport economics have argued that improved connectivity increases investment, productivity and industrial growth through lowering

production costs and expanding access to domestic and international markets (Rostow, 1960; Calderón & Servén, 2014; Donaldson, 2018). From this perspective infrastructure is a key driver of structural transformation.

The actual results of the present investigation support this perspective only to a minor extent. Empirical findings suggest that increases in border efficiency are crucial for logistical performance and a favorable factor for industrial performance. But the data also show that transport infrastructure alone can only account for portion of the difference in industrialisation that is observed. Equally key drivers of whether infrastructure investments translated into broader industrial development were institutional coordination, firm development, productive finance and quality of governance. These results show that infrastructure generates development potential, but does not, by itself, ensure structural transformation.

This interpretation differs from infrastructure-centred models in that it assumes governance as not merely a contextual impact, but the primary mechanism through which infrastructure produces productive economic development. The Corridor Industrialisation Governance Framework does not replace current transport corridor theory but rather extends it by bringing together governance, industrial policy, company capabilities, innovation systems and regional value chain growth into one explanatory framework. The CIGF thus complements classic infrastructure economics and helps to fill major explanatory gaps in the varied industrial outcomes observed in the African transport corridors.

The study also adds to the literature on economic corridors. Previous frameworks have acknowledged the need for integration of transport infrastructure with industrial development, investment promotion and spatial planning. Typically, however, they give little discussion of the institutional arrangements needed to sustain this integration over time. The CIGF identifies six mutually reinforcing governance pillars and establishes their empirical significance through mixed-methods data. The CIGF provides a theoretical explanation and a practical governance architecture for the transformation of transport corridors into industrial corridors.

The contribution of this study is, therefore, not only that governance important, but that governance should be regarded as an integrated and adaptable system that coordinates infrastructure investment, industrial policy, firm development, innovation and regional collaboration. This systems perspective provides a more thorough explanation for the large differences in the results of industrial development by countries with equal levels of investment in transport infrastructure.

7. IMPLICATIONS FOR POLICY

The conclusions of this study have substantial significance for governments, regional economic communities, development finance institutions and the private sector aiming to maximizing the developmental impact of vital transport infrastructure. Evidence indicates that the effectiveness of corridor development should not only be

measured by improvements in logistical performance or trade facilitation. Instead, corridor governance should be judged by how it contributes to industrial productivity, enterprise competitiveness, technical upgrading, employment generation, regional value chain participation and domestic value addition.

Governments should establish dedicated Corridor Industrialisation Authorities (CIAs) to coordinate infrastructure development with industrial policy, investment promotion, trade facilitation, customs administration, enterprise development, environmental management and regional cooperation. These entities should have cross-sectoral mandates allowing for integrated planning, implementation, monitoring and evaluation across ministries and agencies, unlike traditional transport authorities. Such governance frameworks would eliminate institutional fragmentation and ensure that infrastructure investments serve well-defined industrial development objectives.

Second, transport infrastructure planning should be effectively integrated with national industrialization goals. Future investments in corridors should include complementing plans to support industrial parks, special economic zones, logistics hubs, innovation centres, digital infrastructure, energy systems and workforce development. This implies that infrastructure projects need to be designed as elements of wider industrial ecosystems, not as stand-alone technical interventions.

Thirdly, governments should enhance enterprise competitiveness through expanding access to productive finance, technology upgrading programmes, export development initiatives, business incubation services and industrial skills development. Special emphasis should be paid to small and medium-sized firms, which are critical to job creation, supplier growth and local value addition but often lack the financial and technological means to compete in regional production systems. Development finance institutions should also focus on long-term industrial finance to boost productive investment rather than short-term commercial lending.

Fourthly, regional economic communities, particularly the Southern African Development Community (SADC), should improve policy harmonisation to encourage the creation of regional value chains. This will require coordinated industrial policies, harmonised technical standards, simplified customs procedures, mutual recognition of product certification, digital trade platforms, and collaborative investment promotion tactics. Such reforms would allow domestic firms to better participate in cross-border manufacturing networks, and cut structural dependence on imported produced products.

Finally, governments need to establish integrated monitoring and evaluation systems which take into account the performance of the corridor using both transport and industrial indicators. Performance frameworks should also include indicators on manufacturing value added, enterprise growth, employment creation, export diversification,

technology adoption, SME participation, innovation capacity and regional value chain integration, in addition to freight volumes, border processing times and logistics costs. Such multimodal evaluation tools would give policymakers a more thorough sense of whether infrastructure investments are contributing to sustainable structural transformation.

8. Limitations and Future Research Directions

Although this study offers a significant contribution to the literature on transport corridor governance and infrastructure-led industrialisation through the proposed Corridor Industrialisation Governance Framework (CIGF), there are numerous limitations that need to be noted.

First, the study utilized a cross-sectional convergent mixed-methods design which recorded stakeholder views and institutional conditions at one moment in time. While the architecture is suited for studying the governance mechanisms behind corridor growth, it is not possible to make definitive statements about causal links or long-term evolution of industrial transformation. Corridor industrialization is an inherently dynamic process and longitudinal research would allow for a more in-depth understanding of how governance arrangements influence industrial development over time.

Secondly, the empirical analysis was undertaken on two strategically essential transport infrastructure projects, the Kazungula bridge and the upgrading of Beitbridge Border Post. Although these cases provide useful evidence from major Southern African transport corridors, caution should be given when generalising the findings to other geographical regions with diverse institutional, political and economic circumstances. Future comparative studies across other African transport corridors including the North–South Corridor, Central Corridor, LAPSET Corridor and Abidjan–Lagos Corridor , would provide opportunity to examine the broader application of the Corridor Industrialisation Governance Framework.

Third, while the quantitative analysis yielded statistically significant results on the association between governance characteristics and industrialisation outcomes, the analytical approach mostly depended on multiple regression analysis. Although this approach is acceptable to find statistically significant connections, it does not directly quantify the intricate interrelationships between the six governance pillars described in the CIGF. Future research should therefore apply Structural Equation Modelling (SEM), route analysis and mediation analysis, in order to investigate the sequential and interacting linkages described within the framework and to further enhance its empirical validation.

Fourth, the analysis was partly informed by stakeholder assessments of governance quality, enterprise competence and institutional coordination. These perceptions were supported by methodical triangulation through interviews, focus group discussions and documentary analysis. Future research could complement perceptual measures with objective indicators such as manufacturing value added, enterprise productivity, export diversification, innovation

performance, investment flows and employment generation to provide further empirical verification.

Despite these limitations, there are a number of major strengths to the study. A convergent mixed-methods approach, the high involvement of stakeholders, the integration of quantitative and qualitative evidence and triangulation of many data sources are strong empirical bases for the proposed Corridor Industrialisation Governance Framework. Instead of presenting the CIGF as a fully validated causal model, this paper puts forward the CIGF as a theoretically grounded and empirically informed governance framework that explains why transport corridors often fail to deliver sustained industrialisation, despite major improvements in transport infrastructure.

Future study should focus on validating and enhancing the Corridor Industrialisation Governance Framework in diverse African regional economic communities, institutional contexts and industrial sectors. Comparative cross-country studies, longitudinal investigations and advanced causal modelling techniques would further strengthen the theoretical foundations of the framework while enhancing its usefulness as a diagnostic and policy tool for governments, regional organisations and development partners looking to transform transport corridors into competitive industrial corridors.

9. CONCLUSION

The research attempts to explore the transition of transport corridors into industrial corridors that can sustain long-term structural development in Africa. The study found that although strategic infrastructure investments significantly enhance logistics efficiency and regional connectivity, these operational benefits do not automatically result in industrial development, as evidenced by the empirical case of the Kazungula Bridge and the modernisation of the Beitbridge Border Post. Instead, the performance of transport corridors essentially rests on the quality of governance frameworks that link infrastructure investment with industrial policy, firm growth, productive finance, innovation systems and regional value chain integration.

The main contribution of this study is the development of a new governance model, the Corridor Industrialisation Governance Framework (CIGF). It explains industrial corridor development as the result of six interconnected governance pillars: strategic infrastructure governance, institutional coordination, enterprise development and productive finance, regional value chain integration, innovation and knowledge systems, and inclusive adaptive governance. The framework conceptualizes corridor development as a governance ecosystem rather than a simple transport intervention, thus contributing to knowledge on infrastructure-led development and providing a better explanation for the uneven industrialization outcomes across African transport corridors.

The study also adds to policy by showing that infrastructure expenditures should be part of integrated industrial development strategies that boost productive capabilities, institutional coordination, technical upgrading and regional economic cooperation. Thus, governments and development partners must move from infrastructure to

governance systems that purposefully promote competitiveness in manufacturing, firm growth, innovation and local value addition. Only via such integrated governance initiatives can transport corridors develop into industrial corridors that can achieve inclusive, sustainable and revolutionary economic development.

The Corridor Industrialisation Governance Framework shows that transport infrastructure is not an end in itself, but governance is the key mechanism through which infrastructure investments lead to structural transformation. The framework thus provides both a theoretical advancement in corridor development literature and a practical governance model that may guide Africa's transformation from transport corridors to competitive industrial corridors

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