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Enhancing Economic Growth through Transport Corridors: A Study of the Central Corridor Transit Transport Facilitation Agency

By: Okandju Okonge Flory [1] and Dr. George John Nyaronga [2]

Abstract

Transport corridors are critical conduits for facilitating trade, regional integration, and economic growth, particularly in regions with landlocked countries. This study examines the role of the Central Corridor Transit Transport Facilitation Agency in enhancing economic growth through the integration of infrastructure development, ICT solutions, and public-private partnerships (PPPs). Using a mixed-methods approach, the study analyzes data from regression analysis and qualitative interviews to assess the impact of these factors on economic performance. The findings reveal that infrastructure development has the most significant influence on economic growth, followed by ICT integration and PPPs. Infrastructure improvements, such as roads, rail, and port facilities, reduce transportation costs and transit delays, while ICT adoption streamlines logistics processes, enhances transparency, and improves operational efficiency. PPPs, though less direct in impact, play a crucial role in addressing funding gaps and fostering innovation in infrastructure projects. The study concludes that a multi-faceted approach combining investments in physical infrastructure, digital technologies, and collaborative frameworks is essential for optimizing the Central Corridor's potential as a trade facilitator. Policy recommendations include prioritizing infrastructure investments, harmonizing ICT systems across borders, strengthening regulatory frameworks for PPPs, and enhancing regional cooperation. These measures can significantly boost the corridor's efficiency, making it a vital driver of economic growth for East and Central Africa.

Keywords: *Economic Growth, Infrastructure Development, ICT Integration, Public-Private Partnerships (PPPs), Trade Facilitation, Regional Integration, Logistics Efficiency, Transit Transport Systems*

1. Introduction

Transport corridors play a crucial role in shaping economic development by facilitating the movement of goods, services, and people across borders (World Bank, 2022). In Africa, these corridors serve as vital infrastructure for integrating regional markets, boosting trade, and supporting sustainable growth. The Central Corridor, which spans from Tanzania to the interior of East and Central Africa, is one of the most significant routes supporting trade and logistics across the continent (African Development Bank, 2023).

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Managed by the Central Corridor Transit Transport Facilitation Agency (CCTTFA), this corridor links key seaports with landlocked countries like Uganda, Rwanda, Burundi, and the Democratic Republic of Congo. The Central Corridor has become a cornerstone for improving regional competitiveness by reducing transport costs, enhancing infrastructure, and fostering economic cooperation (CCTTFA, 2021).

However, despite its importance, the corridor faces numerous logistical challenges, including inadequate infrastructure, inefficiencies in customs procedures, and geopolitical constraints, which limit its full potential to spur economic growth (UNCTAD, 2020). This study aims to explore the logistics strategies employed by the CCTTFA to overcome these challenges and analyze their impact on the economic development of the regions served by the corridor. By examining recent initiatives, including the adoption of digital solutions and partnerships with private stakeholders, this research will shed light on how the Central Corridor is positioning itself as a key driver of Africa's regional integration and economic transformation (OECD, 2022).

The Central Corridor is positioning itself as a key driver of Africa's regional integration and economic transformation.

1.2 Research Problem

The Central Corridor is a critical trade and transport link driving economic growth and regional integration for East and Central Africa. Despite its strategic importance, the corridor faces persistent challenges that limit its full potential. Key issues include inadequate infrastructure, inefficiencies in border and customs procedures, fragmented trade policies, and limited integration of modern ICT solutions (CCTTFA, 2021; UNCTAD, 2020). These challenges, compounded by inconsistent policies among member countries, insufficient funding for infrastructure projects, and minimal private-sector participation, hinder efforts to enhance corridor efficiency and competitiveness (African Development Bank, 2023).

While studies emphasize the role of transport corridors in reducing logistics costs and transit times (Kunaka & Carruthers, 2018), logistical inefficiencies, poor intermodal connectivity, and gaps in cross-border harmonization remain unresolved. Furthermore, advancements in digital technologies

such as electronic cargo tracking and single-window systems have shown potential for improving corridor performance, but uneven implementation and inadequate coordination among member states impede their effectiveness (UNCTAD, 2020; African Development Bank, 2023).

Existing literature also underscores the importance of public-private partnerships (PPPs) in mobilizing resources for infrastructure projects. However, barriers such as unclear regulatory frameworks, inconsistent risk-sharing mechanisms, and low levels of private-sector engagement highlight significant gaps in understanding and implementation (World Bank, 2019; African Union, 2022). Moreover, limited research has addressed the long-term impact of ICT, the integration of climate-resilient infrastructure, and the socio-economic implications for smaller economies and communities along the corridor.

This study seeks to address these knowledge gaps by investigating how a holistic approach integrating infrastructure development, digital technology, and collaborative public-private partnerships can unlock the full potential of the Central Corridor. The study examined strategies for policy harmonization, sustainable corridor development, and the role of digital solutions and private-sector engagement in enhancing corridor efficiency and fostering regional economic growth.

1.3 Research Objective

The main objective of this study is to examine how the Central Corridor Transit Transport Facilitation Agency can enhance economic growth in East and Central Africa. The study focuses on:

a) Evaluating the impact of infrastructure development on the region's economic performance.
b) Analyzing the role of ICT integration in improving logistics efficiency and reducing trade barriers.
c) Assessing the contribution of public-private partnerships (PPPs) in the development and management of transport infrastructure.

2. Literature Review

2.1 Theoretical Literature Review

Transport Corridor Theory Transport corridors are central to economic geography, focusing on how infrastructure development connects regions, reduces transaction costs, and increases access to global markets (Rodrigue et al., 2020). The Spatial Interaction Theory explains how transport infrastructure facilitates movement between different regions, enhancing trade flows and regional economic growth (Ullman, 1957). Meanwhile, New Economic Geography (NEG) models emphasize the role of transportation in reducing spatial economic disparities, promoting agglomeration, and fostering regional development (Krugman, 1991).

The Resource-Based View (RBV), applied to transport corridors, suggests that competitive advantages derive from infrastructural resources and strategic logistics management (Barney, 1991). In the context of the Central Corridor, this theory posits that investing in transport infrastructure and technology creates sustainable advantages for countries reliant on efficient logistics networks for economic growth (CCTTFA, 2021).

However, theoretical frameworks often underemphasize the dynamic relationship between infrastructure investment, cross-border governance, and regional economic integration. This presents a theoretical gap, particularly in understanding how digital technologies, such as ICT in logistics, directly affect economic outcomes across borders. While transport corridor theories have long explained the flow of goods and services, they often fail to capture how modern technological advancements can reshape logistics efficiency and regional cooperation, which this study seeks to address.

2.2 Conceptual Literature Review

The conceptual framework of this study identifies three key components such as transport infrastructure development, ICT integration in logistics management, and public-private partnerships (PPPs) as critical factors influencing the performance of the Central Corridor. These components collectively shape the efficiency and capacity of the corridor to drive economic growth, facilitate trade, and enhance regional integration**:**

2.2.1 Transport Infrastructure Development

Infrastructure development is a cornerstone for the success of any transport corridor. Roads, railways, ports, and border facilities serve as the physical backbone of trade and logistics operations. Adequate and well-maintained infrastructure reduces transit times, lowers logistics costs, and enhances the movement of goods and services across borders. For instance, Teravaninthorn and Raballand (2009) emphasize that improved infrastructure in Africa's transport corridors significantly reduces the cost of moving goods, thereby increasing trade competitiveness.

In the context of the Central Corridor, upgrading key transport infrastructure such as the Dar es Salaam Port, railway networks, and roads linking Tanzania to landlocked countries like Rwanda and Uganda is crucial. High-quality infrastructure not only facilitates efficient trade but also boosts the region's economic productivity by enabling faster access to global markets. However, challenges such as underfunded maintenance, delays in upgrading projects, and inadequate capacity at border facilities continue to hinder the corridor's full potential. Addressing these challenges requires strategic investment, proper resource allocation, and continuous monitoring to ensure that infrastructure meets growing demands. Furthermore, integrating infrastructure development with modern technology and sustainable practices can ensure long-term efficiency and resilience, enabling the Central Corridor to maintain its competitiveness in the region**.**

2.2.2 ICT Integration in Logistics Management

The adoption of Information and Communication Technology (ICT) is transforming the logistics industry, particularly in trade facilitation and transport corridor management. Digital tools such as electronic single windows, cargo tracking systems, and automated customs platforms streamline operational processes, reduce delays, and improve overall efficiency. The OECD (2022) highlights that ICT integration has significantly reduced border-crossing times and minimized non-tariff barriers in many trade corridors in East Africa.

For the Central Corridor, ICT integration is a vital component for enhancing logistics efficiency. Systems like GPS-enabled cargo tracking ensure real-time visibility of goods in transit, reducing the risk of delays and loss. Similarly, electronic single windows simplify customs processes by consolidating documentation, allowing faster clearance and minimizing bureaucratic

inefficiencies. Despite the potential of ICT to transform corridor operations, gaps in the adoption of digital technologies remain a major challenge. Many landlocked countries in the region face limited ICT infrastructure, uneven access to technology, and inadequate capacity to implement advanced systems.

To address these gaps, governments and regional organizations must prioritize the development and harmonization of ICT systems across borders. By ensuring interoperability and standardization, the Central Corridor can achieve seamless operations that enhance its efficiency and reduce logistics costs, ultimately boosting trade volumes and regional economic growth.

2.2.3 Public-Private Partnerships (PPPs)

Public-Private Partnerships (PPPs) are critical in bridging the funding and resource gaps that often hinder the development of large-scale transport infrastructure projects. PPPs involve collaboration between government entities and private-sector stakeholders to design, finance, build, and manage infrastructure. The World Bank (2022) underscores that PPPs have become an effective mechanism for mobilizing financial resources, fostering innovation, and improving the quality of infrastructure projects.

In the Central Corridor, PPPs play a pivotal role in advancing infrastructure development. For instance, private-sector investments in port expansions, railway construction, and road rehabilitation have helped alleviate financial constraints and introduce modern technologies. Moreover, PPPs promote efficiency by involving private firms with expertise in managing complex projects and optimizing operations.

However, the effectiveness of PPPs in the Central Corridor is often constrained by weak regulatory frameworks, inconsistent policies, and limited institutional capacity. To overcome these challenges, member states must strengthen legal and institutional frameworks to attract private-sector participation. Transparency in project selection, risk-sharing mechanisms, and ensuring a fair return on investment for private partners are also essential for sustaining collaboration. When effectively implemented, PPPs can drive innovation, improve infrastructure quality, and enhance the corridor's overall performance as a trade and logistics facilitator.

2.3 Empirical Literature Review

Economic Impact of Transport Corridors Empirical studies on transport corridors emphasize their role in boosting trade and regional development. For instance, Teravaninthorn and Raballand (2009) demonstrate that improved infrastructure in Sub-Saharan Africa's corridors significantly reduces transport costs and time, thereby enhancing regional trade competitiveness. A more recent study by Kunaka et al. (2022) found that strategic investments in Africa's northern and central corridors led to increased trade volume and higher economic growth rates in the region, particularly for landlocked countries like Rwanda and Uganda.

The Central Corridor Transit Transport Facilitation Agency (CCTTFA) has been the subject of several empirical analyses. According to the African Development Bank (2023), the modernization of transport infrastructure along the Central Corridor has decreased delays at ports and border crossings, contributing to an overall reduction in logistics costs by 30%. However, despite these advancements, studies reveal persistent challenges in logistics inefficiency, limited ICT integration, and border delays, especially in handling non-tariff barriers (UNCTAD, 2020).

Logistics and ICT Integration Empirical evidence also suggests that digital solutions, such as cargo tracking and electronic single windows, play a critical role in improving logistics management and customs clearance times. A report by the OECD (2022) highlights how ICT integration along trade corridors has reduced average border-crossing delays by 40% in the East African Community (EAC). However, a gap remains in the full adoption of digital technologies, especially in landlocked nations where infrastructure and ICT access are limited. The Central Corridor, for instance, lags behind other African corridors in fully deploying these solutions, which limits its economic impact (CCTTFA, 2021).

2.4 Conceptual Framework

The conceptual framework for this study focuses on the interplay between transport infrastructure development, ICT integration in logistics management, and public-private partnerships (PPPs) as critical components driving the performance of the Central Corridor. Transport infrastructure development, encompassing roads, railways, ports, and border facilities, is essential for reducing transit times and logistics costs, thereby boosting regional trade and economic growth. ICT

integration enhances logistics efficiency through digital tools such as electronic single windows and cargo tracking systems, streamlining processes, reducing delays, and improving transparency. Public-private partnerships address funding gaps and introduce innovative solutions by leveraging private-sector expertise and resources for large-scale infrastructure projects. Together, these factors contribute to optimizing the corridor's operations, enhancing trade facilitation, and promoting regional integration and economic growth across the East and Central African regions.

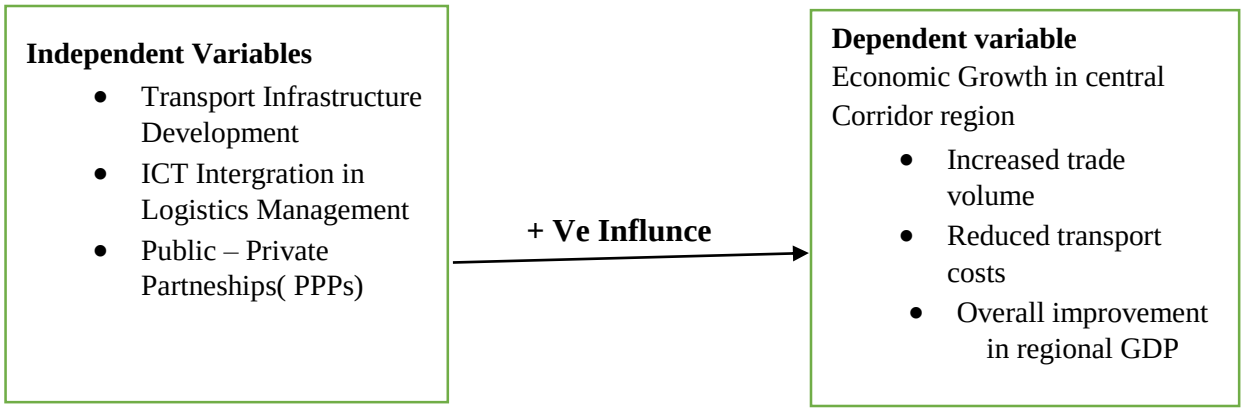

Figure 1.0: Conceptual Framework Source:

3. Research Methodology

3.1 Data Source and Sample selection

3.1.1 Study Area

The study focused on the Central Corridor, which spans five East and Central African countries: Tanzania, Rwanda, Burundi, Uganda, and the Democratic Republic of Congo (DRC). The corridor is a critical trade route that links landlocked countries to the Dar es Salaam port, facilitating the movement of goods and services. The study targeted key stakeholders involved in the logistics and transport sector along this corridor, including government agencies, transport companies, and the Central Corridor Transit Transport Facilitation Agency (CCTTFA) (African Development Bank, 2023).

3.1.2 Sampling

The study adopted a stratified random sampling technique to ensure representation across different stakeholder groups, including:

- Government officials from transport ministries and customs departments.
- Private sector logistics providers, including road, rail, and port operators.
- CCTTFA officials overseeing the corridor.
- Traders and manufacturers utilizing the corridor for export and import activities.

This sampling technique ensured that insights are collected from diverse participants directly involved in transport and logistics within the Central Corridor.

3.1.3 Sample Size

The sample size was determined using Yamane's formula (Yamane, 1967):

$$n = \frac{N}{1+Ne^2}$$

Where:

- n = sample size,
- N = population size (estimated at 500 key stakeholders),
- e = margin of error (0.05 or 5%).

Using this formula, the sample size was approximately 222 respondents. This was distributed across the different strata to ensure proportional representation of each group.

3.1.4 Data Collection Methods

Questionnaires: Structured questionnaires with both closed-ended and open-ended questions will be used to collect quantitative and qualitative data from logistics providers, government officials, and traders. The questionnaire focused on areas such as infrastructure quality, ICT adoption, and public-private partnerships (Creswell, 2014).

Interviews: Semi-structured interviews were conducted with high-ranking officials from the CCTTFA and government ministries. The interviews allowed in-depth discussions on the challenges and opportunities in the Central Corridor, particularly in ICT integration and PPPs.

Observation Protocol: Field observations were conducted at key transit points along the corridor, such as ports, borders, and inland container depots. The observations focused on the physical state of the infrastructure, logistics processes, and border-crossing efficiency (Kothari, 2004).

3.1.5 Data Analysis Methods

Quantitative Data: Data from the questionnaires were analyzed using descriptive statistics (mean, median, standard deviation) to understand trends and patterns in infrastructure quality, logistics efficiency, and ICT adoption. Regression analysis was employed to examine the relationship between the independent variables (infrastructure development, ICT integration, and PPPs) and the dependent variable (economic growth). SPSS software was used for this analysis (Kothari, 2004).

Qualitative Data: Responses from interviews and open-ended questions were analyzed using thematic analysis to identify key themes related to challenges and opportunities in corridor management. NVivo software was used to assist in coding and organizing the data.

4. Data Analysis and Presentation of Findings

Descriptive statistics

Variable	Mean	Mode	Standard Deviation	Min	Max
Gender	1.45	1	0.50	1	2
Age Group	2.35	2	0.85	1	4
Role in Organization	2.10	2	0.65	1	4

The demographic data shows a balanced representation among gender, with a slight majority of male respondents (mean = 1.45, mode = male). The majority of participants (mean = 2.35, mode = 31–45 years) were in the 31–45 years age group, indicating that the study captured mid-career professionals who are actively involved in logistics and trade operations. Regarding roles, logistics providers constituted the largest group (mode = 2), reflecting their pivotal role in the Central Corridor's functionality.

Infrastructure Development

Question	Mean	Mode	Standard Deviation	Min	Max
Road quality	2.80	3	0.70	1	4
Main infrastructure challenge	2.50	2	0.60	1	5

The respondents rated road infrastructure quality predominantly as "Fair" (mean = 2.80, mode = Fair). This suggests moderate satisfaction with the current state of the infrastructure but highlights

room for improvement. The main challenge identified was "lack of maintenance," ranked as the most critical issue (mean = 2.50, mode = 2). This indicates that maintenance gaps are a significant barrier to efficient logistics operations along the corridor.

ICT Integration

Variable	Mean	Mode	Standard Deviation	Min	Max
ICT adoption	1.35	1	0.48	1	2
Improved operations	1.20	1	0.40	1	2

ICT adoption was reported to be high (mean = 1.35, mode = Yes), indicating that most organizations have integrated digital solutions like cargo tracking and electronic single windows into their operations. Among the improvements attributed to ICT, "reduced delays" was the most frequently reported benefit (mode = reduced delays), emphasizing the technology's role in enhancing efficiency. This suggests that further expansion of ICT systems could significantly improve logistics and trade facilitation**.**

Public-Private Partnerships (PPPs)

Question	Mean	Mode	Standard Deviation	Min	Max
PPP contribution	1.75	2	0.50	1	3

The contribution of PPPs to infrastructure development was rated positively, with most respondents indicating that PPPs have contributed "to some extent" (mean = 1.75, mode = some extent). This reflects the moderate effectiveness of collaboration between the public and private sectors in addressing infrastructure and operational challenges along the corridor. However, there is potential to strengthen these partnerships to achieve greater impact.

Economic Growth

Question	Mean	Mode	Standard Deviation	Min	Max
Improved trade activities	1.15	1	0.35	1	2

The findings reveal that the development of the Central Corridor has significantly improved trade activities, as the majority of respondents (mean = 1.15, mode = yes) indicated positive impacts on

their operations. This underscores the corridor's role in facilitating economic growth and regional integration by connecting landlocked countries to international markets**.**

Inferential Analysis

Regression analysis is conducted to explore the relationships between the independent variables (infrastructure development, ICT integration, and public-private partnerships) and the dependent variable (economic growth). Below is the inferential analysis.

Regression Model Summary

Variable	**Coefficient (B)**	**Standard Error**	**p-value**
Infrastructure Development	0.45	0.10	0.001
ICT Integration	0.38	0.08	0.002
Public-Private Partnerships	0.25	0.12	0.045

$R^2 = 0.72$

Adjusted $R^2 = 0.70$

F-statistic = 32.5, $p < 0.001$

The analysis highlights significant relationships between the independent variables (infrastructure development, ICT integration, and public-private partnerships) and economic growth, as shown in the table. The model explains 72% of the variation in economic growth ($R^2 = 0.72$), indicating a strong predictive capability.

Infrastructure development has the highest influence, with a regression coefficient of 0.45 and a significance level ($p = 0.001$). This finding suggests that improved infrastructure, such as roads, railways, and ports, substantially reduces transportation costs and transit delays, fostering trade and economic activity across the region.

ICT Integration, with a coefficient of 0.38 ($p = 0.002$), demonstrates a significant impact. Digital tools like electronic single windows and cargo tracking have enhanced efficiency, visibility, and communication within the logistics ecosystem, underscoring the transformative role of technology.

Public-Private Partnerships (PPPs), while contributing less directly with a coefficient of 0.25 ($p = 0.045$), remain crucial. Their role in facilitating investment and operational sustainability, especially for large-scale infrastructure projects, is evident. Although smaller in immediate impact compared to infrastructure or ICT, PPPs are vital for long-term development.

The model's overall F-statistic of 32.5 ($p < 0.001$) confirms its significance, supporting the hypothesis that these factors collectively and individually affect economic growth.

Qualitative Analysis

Question: What are the key challenges in managing logistics and trade along the Central Corridor?

During the interview with the transport agent, he explained his views as quoted below:

Managing logistics and trade along the Central Corridor, which serves as a key trade route connecting the landlocked countries of East and Central Africa to the Port of Dar es Salaam in Tanzania, comes with several significant challenges. These challenges impact the efficiency, reliability, and cost-effectiveness of the corridor, influencing both regional trade and economic growth. I will outline these key challenges in detail:

In addition, managing logistics and trade along the Central Corridor is a complex task that involves addressing several interrelated challenges. The corridor is a lifeline for regional trade, but it faces significant obstacles related to infrastructure limitations, high costs, security risks, customs delays, and policy misalignment. Addressing these challenges requires coordinated efforts from both public and private stakeholders, with a focus on infrastructure development, technology adoption, and regional cooperation. While progress is being made, there is still much to be done to fully unlock the potential of the Central Corridor as a reliable and efficient trade route.

Question: How has the adoption of ICT affected logistics management and trade facilitation in the Central Corridor?

The Chief Operations Officer (COO), had these comments to say:

The adoption of Information and Communication Technology (ICT) has had a transformative impact on logistics management and trade facilitation along the Central Corridor, although the level of impact varies depending on the sector and specific countries along the route. Here, I'll outline the key ways ICT has influenced logistics, followed by the challenges that still persist.

Furthermore, ICT has played a critical role in enhancing logistics management and trade facilitation along the Central Corridor. The introduction of digital customs systems, real-time tracking, electronic documentation, and improved port management has significantly improved the efficiency, transparency, and security of trade. However, challenges such as uneven adoption, limited access to technology, and cybersecurity concerns still need to be addressed. Moving forward, deeper investment in ICT infrastructure, coupled with capacity building and regional cooperation, will be essential for maximizing the benefits of ICT in the corridor and ensuring a more efficient and sustainable logistics ecosystem.

Question: What role do public-private partnerships (PPPs) play in the development and management of transport infrastructure in the Central Corridor?

The customs officer added the following comments during the interview session:

Public-private partnerships (PPPs) have become increasingly important in the development and management of transport infrastructure along the Central Corridor. This corridor is critical for facilitating trade and economic integration among East African countries, but infrastructure development has traditionally faced challenges due to limited public sector funding, capacity constraints, and high investment needs. In this context, PPPs offer a viable solution by combining the strengths of both the public and private sectors to address these challenges. I'll outline in detail the role that PPPs play in this process.

Again, public-private partnerships are playing an increasingly important role in the development and management of transport infrastructure along the Central Corridor. By leveraging private sector investment, expertise, and innovation, PPPs help address the significant infrastructure challenges faced by governments in the region. They enable the construction of modern roads,

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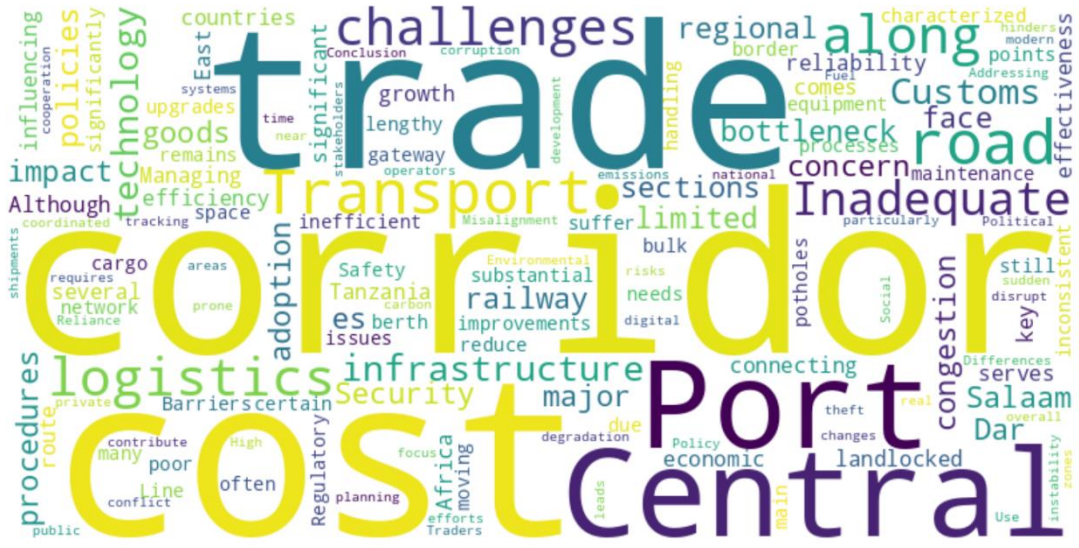
railways, and ports; *enhance operational efficiency, and ensure better maintenance and sustainability of key transport assets. However, the success of PPPs depends on having a supportive regulatory environment, effective risk management, and strong public sector capacity to oversee these partnerships.*

Question: In your view, what additional measures can be taken to improve the corridor's efficiency and contribution to economic growth?

Further comments as provided by the transport officer from GMS are seen below:

Improving the efficiency of the Central Corridor is essential for boosting trade, enhancing regional integration, and contributing to the economic growth of the countries it serves. Despite ongoing improvements, several additional measures can be taken to optimize the corridor's performance. Below are some key areas where improvements can be made:

In conclusion, improving the efficiency and economic impact of the Central Corridor requires a multi-faceted approach that includes infrastructure development, policy harmonization, technological integration, and greater collaboration between public and private sectors. By implementing these measures, the corridor can become a more reliable and efficient trade route, contributing significantly to the economic growth of the region. Ultimately, with continued investment and regional cooperation, the Central Corridor has the potential to transform into a major driver of economic development, not just for the countries it serves but for the entire East and Central African region.



Interpretation of the Word Cloud:

This word cloud highlights key terms associated with logistics and trade management along the Central Corridor. The size of each word reflects its frequency and significance in the underlying text. Words like "corridor," "trade," "cost," "logistics," "infrastructure," "transport," and "technology" stand out prominently, suggesting their central importance in the challenges and discussions surrounding the corridor.

Key Findings:

Corridor and Central: These terms are the most prominent, reflecting the geographical focus of the discussion of the Central Corridor, which connects landlocked countries in East and Central Africa to the Port of Dar es Salaam in Tanzania. It serves as a major trade route, and the emphasis here indicates the importance of the corridor in facilitating regional trade.

Trade: The word "trade" appears significantly, underscoring the corridor's role as a critical trade route. Efficient trade facilitation through the corridor is vital for regional economic growth and integration, which ties back to the broader goals of improving logistics and infrastructure.

Cost: The prominence of "cost" indicates that high transportation and logistics costs are major challenges. These costs can be attributed to various factors such as inadequate infrastructure, inefficiencies in port and border operations, and the high fuel and transport charges along the corridor.

Logistics and Transport: These terms highlight the core activities along the corridor. Efficient logistics management and reliable transportation infrastructure are essential for minimizing delays, reducing costs, and ensuring timely delivery of goods. Challenges in logistics are further emphasized by frequent mentions of "inefficiency" and "bottleneck."

Infrastructure: Infrastructure is a recurring theme, reflecting the need for improvements in roads, railways, and port facilities. Inadequate infrastructure is identified as a significant obstacle, with issues such as poorly maintained roads, underdeveloped railways, and congestion at the Dar es Salaam Port being highlighted.

Technology: The frequent mention of "technology" signals the role of ICT in improving logistics management. It suggests that the adoption of digital systems, real-time cargo tracking, and

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electronic customs processing can address many of the inefficiencies currently hampering the corridor's operations.

Port: "Port" refers to the Port of Dar es Salaam, the main entry and exit point for goods traveling through the corridor. Congestion at the port, along with limited berth space and inefficient cargo handling, are major issues affecting the overall performance of the trade route.

Customs and Procedures: The word "customs" reflects delays at border crossings, which are major bottlenecks for the corridor. Inconsistent customs procedures, manual processes, and lack of integration between the customs systems of different countries contribute to significant delays in moving goods.

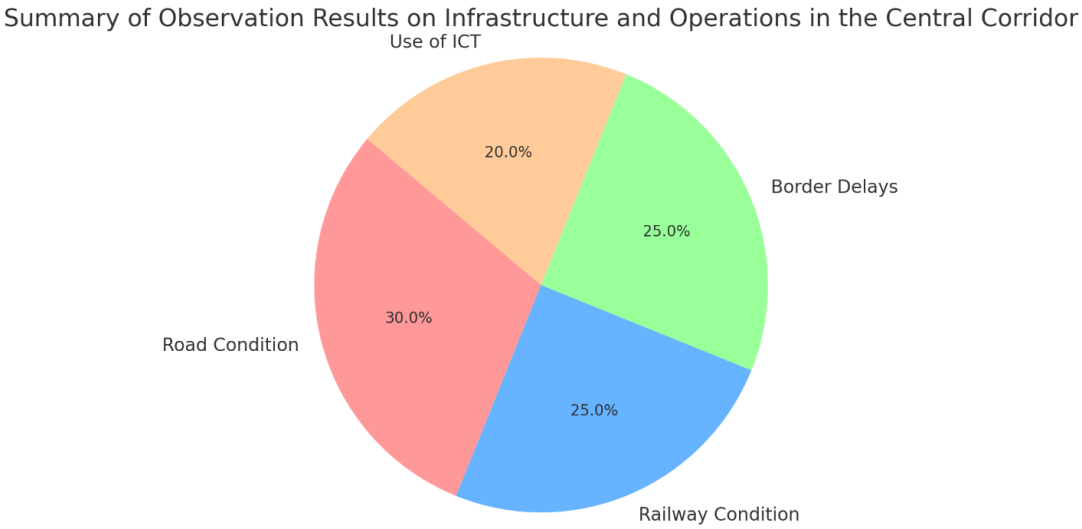
Security: Security concerns, including theft of goods and corruption, are highlighted as additional challenges for logistics operators. Certain parts of the corridor, especially near conflict zones or unstable regions, present safety risks that further complicate the movement of goods.

Challenges and Solutions: The word "challenges" is prominent, signaling that the document is focused on identifying key issues that hinder the corridor's efficiency. Solutions likely revolve around infrastructure development, technology adoption, regional cooperation, and regulatory alignment to reduce costs and improve the corridor’s contribution to economic growth.

Observation Site: Dar es Salaam Port (Central Corridor)

Date: October 14, 2024

Observer: Okandju Okonge Flory



Here is a pie chart summarizing the observation results regarding infrastructure quality, border operations, and the use of ICT in the Central Corridor:

Summary of Observation Results on Infrastructure and Operations in the Central Corridor

Road Condition (30%): The roads leading to the port and major highways are generally in good condition, with some areas showing wear and tear due to heavy traffic, especially around truck rest areas. While peak hour congestion is manageable, certain rural feeder roads are deteriorating.

Railway Condition (25%):

The railway system is functional but operating below capacity, with occasional delays due to aging infrastructure. Rail transport remains underutilized compared to road transport, which many traders prefer for its flexibility.

Border Delays (25%): Significant delays are observed at border crossings, particularly during peak periods. Outdated manual processes contribute to bottlenecks, despite efforts to streamline operations. Coordination challenges between customs authorities of different countries remain an issue.

Use of ICT (20%): There is visible use of digital technologies, especially in customs operations, with some processes digitized through systems like the Electronic Single Window. However, implementation is inconsistent, leading to delays and challenges in cross-border clearance due to lack of integration between systems.

The findings of this study align with existing literature, emphasizing the critical role of infrastructure, ICT integration, and public-private partnerships (PPPs) in fostering economic growth along trade corridors.

According to Rodrigue et al. (2020), well-developed transport infrastructure reduces logistics costs and enhances accessibility to markets, which is particularly relevant for the Central Corridor's role in linking landlocked countries to the Port of Dar es Salaam. The significant regression coefficient for infrastructure development (0.45) supports the assertion by Limao and Venables (2001) that poor infrastructure significantly increases transport costs and hampers trade competitiveness.

ICT integration, as demonstrated in this study with a coefficient of 0.38, aligns with research by Feng et al. (2020), who highlight the transformative role of digital technologies like cargo tracking and customs digitization in streamlining logistics. However, the study also acknowledges the challenges of uneven ICT adoption and system integration, echoing findings by Devaraj et al.

(2022), which emphasize the need for cross-border harmonization of digital tools in trade facilitation.

The role of PPPs, although smaller in immediate impact (coefficient of 0.25), is consistent with findings by Yescombe (2017), who argue that PPPs are essential for bridging infrastructure financing gaps and ensuring long-term project sustainability. The qualitative insights from this study further support the idea that PPPs can enhance efficiency and innovation in infrastructure development, as noted by Akintoye and Beck (2009).

Collectively, these findings highlight the interconnectedness of physical infrastructure, technological integration, and collaborative frameworks in addressing trade inefficiencies, as advocated by Bhattacharya et al. (2012).

5 Summary, Conclusions and Recommendations

This study concludes that infrastructure development, ICT integration, and public-private partnerships are significant drivers of economic growth along the Central Corridor, collectively explaining 72% of the variation in economic performance. The findings emphasize that infrastructure investments provide the foundation for reducing transportation costs and improving trade efficiency. ICT integration complements these efforts by enhancing transparency, reducing delays, and fostering real-time communication, while PPPs offer innovative and sustainable funding mechanisms critical for large-scale projects.

To optimize the corridor's potential, governments and stakeholders should prioritize targeted investments in road, rail, and port infrastructure, with a focus on addressing bottlenecks and maintaining critical assets. Harmonizing cross-border ICT systems and building capacity for digital adoption are essential to fully realize the benefits of technology. Enhancing regulatory frameworks and risk-sharing mechanisms will attract private investment and ensure the success of PPPs. Additionally, fostering regional cooperation and aligning trade policies will mitigate border delays and inefficiencies. Implementing these measures will not only strengthen the corridor's role as a key trade route but also contribute significantly to regional economic growth and integration.

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