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Editorial

Journal of Economics and Behavioral Studies (JEBS) provides a distinct avenue for quality research in the ever-changing fields of economics & behavioral studies and related disciplines. Research work submitted for publication consideration should not be limited to conceptualization of economics and behavioral developments but comprise interdisciplinary and multi-facet approaches to economics and behavioral theories and practices as well as general transformations in the fields. Scope of the JEBS includes: subjects of managerial economics, financial economics, development economics, finance, economics, financial psychology, strategic management, organizational behavior, human behavior, marketing, human resource management and behavioral finance. Author(s) should declare that work submitted to the journal is original, not under consideration for publication by another journal and that all listed authors approve its submission to JEBS. Author (s) can submit: Research Paper, Conceptual Paper, Case Studies and Book Review. Journal received research submissions related to all aspects of major themes and tracks. All submitted papers were first assessed by the editorial team for relevance and originality of the work and blindly peer-reviewed by the external reviewers, depending on the subject matter of the paper. After the rigorous peer-review process, the submitted papers were selected based on originality, significance and clarity of purpose. The current issue of JEBS comprises papers of scholars from Uganda and South Africa. Asset Management and Financial Performance of Construction Companies, Modeling Premature Adult Mortality From Non-Communicable Diseases, Foreign Exchange Rate and GDP Growth Vis-À-Vis Trade Balance, Managing the Knowledge Supply Chain: Human capital, Structural Capital and Graduate Employability, Government Expenditure and Inflation Vis-À-Vis Trade Balance, Talent Management Practices and Performance of MDAs, Role of Corporate Governance in Municipal Risk Management and Mediating Effect of Employee Engagement on the Relationship Between Talent Management Practices and the Performance of MDAs were some of the major practices and concepts examined in these studies. The current issue will therefore be a unique offer where scholars will be able to appreciate the latest results in their field of expertise and acquire additional knowledge in other relevant fields.

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PAPERS

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Asset Management and Financial Performance of Construction Companies in Greater Kampala Metropolitan Area

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Abstract: The financial performance of construction companies is increasingly dependent on effective asset management practices that enhance operational efficiency, reduce project delays, and strengthen long-term sustainability. Despite the construction sector's significant contribution to Uganda's economic development, firms within the Greater Kampala Metropolitan Area continue to experience weak profitability, high debt ratios, and cost overruns, partly attributed to poor asset management systems. This study examined the effect of asset management on the financial performance of construction companies in the region, focusing on three key dimensions: asset register accessibility, repair and maintenance scheduling, and budget tracking and forecasting. Guided by the Dynamic Capabilities Theory, the study adopted a cross-sectional survey design and collected data from 191 construction companies selected through proportionate sampling. Structured questionnaires were used to gather quantitative data, and instrument validity and reliability were confirmed through expert review and Cronbach's Alpha. Data were analyzed using descriptive statistics, correlation analysis, and hierarchical regression. Findings revealed that all three asset management practices were positively associated with financial performance. Asset register accessibility showed a moderate significant relationship with financial performance ($r = .313$, $p < .01$), while repair and maintenance scheduling demonstrated a weaker but significant association ($r = .273$, $p < .01$). Budget tracking and forecasting also exhibited a positive relationship ($r = .168$, $p < .01$). Hierarchical regression results further indicated that asset register accessibility contributed the largest increase in explained variance (9.4%), followed by budget tracking and forecasting (2.7%), while the contribution of repair and maintenance scheduling was positive but minimal and statistically insignificant in the final model. Overall, the models explained 15% of the variance in financial performance. The study concludes that effective asset management enhances financial performance, particularly when firms maintain accessible and up-to-date asset registers and implement robust budgeting and forecasting systems. It recommends that construction firms strengthen digital asset management systems, adopt preventive maintenance schedules, and integrate data-driven financial planning tools to improve profitability, ensure timely project delivery, and enhance financial resilience in an increasingly competitive construction environment.

Keywords: *Asset management, financial performance, asset register accessibility, maintenance scheduling, budget tracking, construction companies, Greater Kampala Metropolitan Area.*

1. Background To The Study

The construction industry is a key element in global economic performance, as it stimulates infrastructure development, employment, and technological advancements (World Bank, 2023; Deloitte, 2024). According to Lu & Ye (2022), the asset management process encompasses the stages of planning, acquisition, maintenance, and performance tracking of assets, which are crucial for smooth operations and the financial stability of construction firms. The building and construction market, for its part, is estimated at around 11.4 trillion US dollars in 2024, with an increase of up to 16–17 trillion US dollars expected by 2030 (Deloitte, 2024). According to Egbelakin et al. (2024), the total turnover for the top 100 global contractors increased by 14.1 percent to $ 1,819 billion in 2021, while their combined market capitalization rose by 13.3 percent to $ 662,460 billion. The building and construction sector accounted for 5 to 7 percent of global GDP and employed more than 174 million people worldwide, thereby contributing significantly to achieving sustainable development and economic progress (International Labour Organization [ILO], 2023; World Bank, 2023). Practices of asset management, such as digital transformation, resource tracking, and maintenance planning, are becoming increasingly crucial in supporting this growth by ensuring the efficient use of resources, reducing project delays, and facilitating better financial returns (PwC, 2023).

Across the African continent, the construction industry has consistently posted growth rates, making significant contributions to regional infrastructure and economic transformation (African Development Bank, 2023). The African construction market in 2022 was valued at 13 trillion US dollars, having grown from its initial size of 10 trillion US dollars. It is expected to reach 219.66 billion US dollars in 2024 and 232.08 billion US dollars by 2025 (Lopes & Banaitienė, 2024; Next Move Strategy Consulting, 2025). This industry accounts for approximately 6% of global GDP and employs more than 100 million people; thus, it is a significant factor in reducing poverty and promoting urbanization on the continent (International Labour Organization [ILO], 2023). Generally, in Africa, the state of asset management practices appears weak, characterized by poor maintenance systems, inadequate records, and outdated technologies (Maphosa, 2025). They create barriers to project delivery timeliness, cost efficiency, and financial sustainability in the long run (Soni & Smallwood, 2024). While there is increased adoption in some countries of advanced technologies such as Building Information Modeling and blockchain-enabled asset management systems, the pace of their adoption remains irregular across the continent (Ogunbiyi-Badaru et al., 2024). Therefore, it goes without saying that asset management frameworks should be developed to enhance performance and resource efficiency, thereby promoting competitiveness within the African construction landscape (Sarah & Probohudono, 2024).

It accounts for over 12 percent of the national GDP and lies at the heart of infrastructure development and employment creation in East Africa, particularly in Uganda (Hakizimana et al., 2024; Construct Uganda Expo, 2026). In Uganda, the GDP from construction decreased from Ugandan shillings 2256.74 billion in the third quarter of 2021 to Ugandan shillings 2190.60 billion in the fourth quarter of the same year, but it increased later to Ugandan shillings 2959.99 billion in the second quarter of 2025, hence a recovery and steady growth in the sector (Tukundane & Yang, 2024; Trading Economics, 2026). Despite that positive upward trend, construction companies in the Greater Kampala Metropolitan Area have continued to experience serious financial problems. These include profit margins ranging from 3 to 7 percent and high debt ratios, which signal instability and threats to sustainability (Aguome et al., 2024). Obicci (2024) confirms that poor asset management, characterized by limited access to asset registers, inconsistent scheduling for repairs and maintenance, and weak budget tracking systems, forms the primary basis for poor financial performance. Obicci et al. (2025) concluded that, as the country has invested heavily in infrastructure, asset management is no longer an option but a necessity for ensuring value for money, project sustainability, and improved financial performance in Kampala Metropolitan Area construction firms.

The financial performance of construction companies stimulates economic growth, infrastructure development, and employment opportunities in Uganda (Hakizimana et al., 2024). Notably, most construction firms have implemented various asset management practices to track project progress, optimize resource utilization, and ensure timely project completion within the set budget (Tukundane & Yang, 2024). Despite these efforts, the financial performance of most construction companies in Uganda remains low, with profit margins ranging from 3 to 7 percent (Aguome et al., 2024). The equity returns are minimal, and most firms retain a high proportion of debt, which puts them at risk regarding financial stability and sustainability (Obicci et al., 2025). If the situation persists, it is likely to affect the liquidity status, causing delays and compromising the quality of projects, thus eroding investor confidence and suppressing economic growth (World Bank, 2023). These situations have been linked to poor asset management, characterized by obsolete systems, inadequate project monitoring, and inefficient resource utilization, which exacerbates financial constraints (Obicci, 2024). Hence, this study has investigated the gaps between asset management and the financial performance of construction firms in Uganda, providing suggestions aimed at achieving sustainable growth, improved project deliverables, and enhanced financial resilience (Tukundane & Yang, 2024).

2. Literature review

Theoretical Review

The study is guided by the Dynamic Capabilities Theory formulated by David Teece, Gary Pisano, and Amy Shuen in 1997. It states that organizations realize sustainable competitive advantage through competence building, integrating, and reconfiguring internal and external competencies in response to changing environments (Teece, 2023; Teece, Pisano, & Shuen, 1997). It assumes that firms operate in dynamic markets where their success hinges on their ability to sense opportunities, seize them through appropriate resource allocation, and adapt their operations to maintain long-term performance (Mele et al., 2024; Teece, 2018).

Furthermore, the theory posits that learning, innovation, and flexibility are enabling processes for firms to adapt under uncertainty, thereby ensuring continued competitiveness (Ostadi et al., 2024; Eisenhardt & Martin, 2000). In the context of this study, Dynamic Capabilities Theory can be used to explain how construction companies can improve their financial performance by better managing assets, such as maintaining accessible asset registers, scheduling timely repairs and maintenance, and ensuring accurate budget tracking and forecasting. Such practices demonstrate a firm's propensity to adjust its physical and financial resources in response to fluctuating project demands and changing economic conditions, thereby ensuring efficient operations and long-term stability (Köhler et al., 2022; Mele et al., 2024; Teece, 2018).

Dynamic Capabilities Theory has been applied to the construction industry to understand how firms perceive and leverage technological advancements, their predisposition to digital transformation, and the impact of fluctuating market conditions. Wijayarathne et al. (2024) noted that construction firms with strong dynamic capabilities successfully integrate digital tools to improve project performance, asset management, and ultimately, financial outcomes. Similarly, Aghimien et al. (2023) identified how firms that capitalize on innovation, knowledge integration, and technological adaptability tend to be resilient and realize higher productivity in the era of the Fourth Industrial Revolution. Ostadi et al. (2024) further demonstrated how dynamic capabilities provide a strategic roadmap for integrating Industry 4.0 technologies and how these help firms reconfigure resources to enhance profitability. These various studies reveal how dynamic capabilities allow firms to manage asset utilization, reduce operational risks, and sustain financial growth in a dynamic environment. Some recognized limitations of this theory include difficulties with empirically measuring capabilities and the challenge of establishing a direct link between dynamic capabilities and short-term financial outcomes (Teece, 2023; Helfat & Peteraf, 2015). The theory, however, remains highly relevant to this study, as it provides a sound conceptual base for understanding how construction firms in the Greater Kampala Metropolitan Area can improve their financial performance through continuous development and strategic management of their asset-related capabilities.

Empirical literature review

Asset register accessibility and financial performance

Access to the asset register is a critical component in asset management, directly impacting the financial performance of a firm through the precise tracking, utilization, and control of resources. Studies on enterprise asset management systems indicate that firms with structured and accessible asset records are more effective in optimizing resource allocation, reducing downtime, and enhancing financial accountability (Hastings, 2021; Komonen et al., 2022). Research in engineering and infrastructure organisations demonstrates that digitalized asset registers enhance operational efficiency and profitability by enabling timely decision-making and lifecycle monitoring of assets (Aubry & Lavoie-Tremblay, 2022). These findings suggest that accessible asset records enhance operational efficiency and profitability, indicating that construction companies that can maintain up-to-date and easily retrievable asset registers can better monitor project costs and optimize investments. This insight is particularly relevant to the construction sector in Uganda, where inadequate asset tracking has led to the underutilization of resources and financial flow leakages. However, there is limited empirical evidence on how asset register accessibility affects the financial performance of construction firms in Uganda.

Further evidence is provided by studies on asset utilization and firm performance, which indicate that access to reliable asset information positively influences profitability and liquidity outcomes. Research examining firm-level asset management practices found a significant positive relationship between effective asset documentation and financial performance, including improved returns on equity and stronger liquidity positions (Al-Matari et al., 2023). Similarly, investigations within the utility and energy sectors underline that structured systems for managing asset data lead to better maintenance planning, timely replacement of worn-out assets, and reduced operational costs (Gavrikova, Volkova, & Latyshev, 2022). These findings collectively support the notion that accessible asset registers are not merely administrative tools, but strategic mechanisms that enable firms to align asset management with financial objectives, minimize risks, and enhance overall performance. In relation to the construction sector, this underlines that accessible and accurate asset records can provide managers with actionable insights regarding budgeting, resource deployment, and project planning. Nevertheless, most existing studies focus on non-construction sectors, leaving a limited understanding of this relationship in project-based construction environments.

Further illustration from the construction and manufacturing context emphasizes asset register accessibility. Studies within construction firms show that organisations with stronger asset information systems tend to produce higher-quality financial reporting and experience better financial outcomes due to improved transparency and accountability (Ofori & Toor, 2023). Bolhassan et al. (2022) in the Malaysian construction industry emphasized that digitally captured and accessible asset records are critical for verifying smart contracts, monitoring project progress, and improving transparency. Research on asset management reporting construction practices further indicates that firms with structured asset information are better positioned to forecast cash flows and budget effectively (Hashim, Mohd-Nawawi, & Ahmad, 2021). All of the above contributory works demonstrate that improved access to the asset register contributes to enhanced financial performance through better decision-making, increased accountability, and more effective resource management. This synthesis presents a compelling argument that enhancing asset register accessibility is of strategic importance to ensure profitability and operational efficiency in construction companies within the Greater Kampala Metropolitan Area. However, limited studies have examined this issue within Sub-Saharan Africa, particularly in Uganda, which justifies the need for this study.

Repair and maintenance scheduling and financial performance

Scheduling repairs and maintenance is, therefore, a crucial aspect of asset management, significantly impacting the operational efficiency and financial performance of organizations. Okan and Aksoy (2022) analyzed the effect of proactive maintenance scheduling at Turkish Airlines Technic. This systematic planning approach drastically reduced maintenance costs while increasing profitability. It was apparent from their work that preventing unplanned stoppages in production by timely repairs ensures resource utilization with minimum disruption to operations and long-term financial viability. Rediske et al. (2022) analyzed maintenance practices at photovoltaic plants and identified key performance indicators linked to efficient maintenance scheduling, including increased output and reduced operating costs. In this respect, the study emphasized that predictive and timely maintenance enables organizations to utilize resources effectively by anticipating repair needs and minimizing unexpected losses. Delays in equipment or structural element repairs in a construction context increase costs and extend project timelines, reducing overall financial performance. From these observations, repair and maintenance scheduling is a strategic measure that preserves asset value and enhances resource utilization to attain high financial outcomes. What emerges from these studies is that accessible and structured maintenance plans form the basis for financial resilience, showing that firms with scheduled repairs are better placed to control costs and maintain profitability in dynamic operational environments. However, limited empirical studies have examined how repair and maintenance scheduling influences financial performance in construction firms within developing countries such as Uganda.

In the construction industry, the scheduling of repair and maintenance is particularly relevant to project performance and cost management. Mohammadi et al. (2022) applied lean principles to planning and scheduling in road maintenance and found that integrating maintenance activities into project schedules reduces resource wastage and delays, thereby improving project delivery. Outcomes from their study indicated that systematic maintenance resulted in better utilization of labor, materials, and machinery, leading to reduced operational costs and improved financial performance. Karuga et al. (2024) reported that projects with structured maintenance and financial planning attained higher completion rates and improved profitability. Hameed et al. (2024) further demonstrated the role of key performance indicators in monitoring building maintenance performance, highlighting how regular and scheduled maintenance reduces operational inefficiencies, extends asset life, and enhances cost-effectiveness. These studies confirm that maintenance scheduling links operational processes to organisational objectives and serves as a strategic management tool beyond technical requirements. Construction firms that apply systematic maintenance protocols are less likely to experience unexpected expenditure, project delays, or declining financial performance, reinforcing the need for structured maintenance scheduling within organisational planning frameworks. Nevertheless, existing research largely focuses on infrastructure projects outside the Ugandan context, leaving limited evidence on how maintenance scheduling practices affect financial performance among construction firms in the Greater Kampala Metropolitan Area.

The impact of repair and maintenance scheduling on financial performance has been further strengthened with technological advancements, enabling predictive planning and real-time monitoring of assets. Hasanuddin and Abd Rahim (2024) examined the applications of technology in building facilities management. They

demonstrated that automated scheduling systems enhance maintenance timeliness, reduce human error, and lead to cost savings and improved profitability. Zhao et al. (2022) developed a conceptual framework for applying digital twin technologies to building operation and maintenance, demonstrating that real-time monitoring, combined with predictive maintenance, minimizes downtime and improves resource utilization. Abidi et al. (2022) applied machine learning techniques for predictive maintenance in Industry 4.0 environments, finding that data-driven scheduling reduces unplanned expenditures and supports long-term financial resilience. Dzulkifli et al. (2021) reviewed best practices in building maintenance management and concluded that organizations with scheduled maintenance experience fewer delays, lower operational costs, and improved asset utilization. These studies collectively indicate that integrating technology with repair and maintenance scheduling strengthens the relationship between operational efficiency and financial performance. Construction companies, especially in fast-developing urban environments, need predictive, data-driven, and technology-enabled maintenance strategies to control costs and sustain financial performance. However, there is limited empirical evidence on the adoption and financial implications of technology-enabled maintenance scheduling in construction firms within Uganda, which this study seeks to address.

Budget tracking, forecasting and financial performance

Budget tracking and forecasting are significant features of financial management practices that have a substantial impact on a firm's organizational performance by facilitating appropriate resource allocation, controlling costs, and informing strategic decisions. Studies on financial forecasting and budgeting in small and medium enterprises show that strategic budgeting and revenue projections improve liquidity management and overall financial resilience (Lavia López & Hiebl, 2021; Pavlatos & Kostakis, 2022). They indicate that firms embracing detailed forecasting and continuous budget monitoring are better able to identify cash flow gaps, reduce unplanned expenditures, and optimize resources. Similarly, research on structured budgeting practices demonstrates a positive relationship between formal budget management and improved financial performance, suggesting that firms with sound budgeting regimes support strategic investments and operational planning more effectively (Grosu, Socoliuc, & Hlaciuc, 2023). Recent literature on modern approaches to financial forecasting emphasizes that proactive budgeting enables firms to respond quickly to market fluctuations and reduce resource misallocation, thereby sustaining profitability (Kliestik et al., 2024). These findings demonstrate that effective budget tracking and forecasting enhance financial control and support informed managerial decision-making. This is especially critical to the financial success of construction firms, as it enables the monitoring of project costs and revenues to ensure profitability. However, limited empirical evidence exists on how budget tracking and forecasting influence financial performance among construction firms in developing-country contexts such as Uganda.

Empirical evidence also indicates that effective budgeting and forecasting practices enhance project and financial performance in the construction sector. Studies on construction project financial management reveal that firms applying systematic budget monitoring and accurate forecasting experience fewer cost overruns, higher completion rates, and better returns on investment (Olawale & Sun, 2022). Research on construction contractors in emerging economies further indicates that real-time cost tracking and predictive forecasting contribute to improved profit margins and stable cash flows (Amoah & Pretorius, 2023). Additional evidence from the Ugandan construction sector suggests that detailed budget planning and forward-looking financial forecasting enhance risk management and reduce financial instability in project delivery (Aguome et al., 2024). Collectively, these studies suggest that budget tracking and forecasting, as part of financial management practices, enhance resource management, risk handling, and long-term planning, ultimately leading to improved profitability. Nevertheless, most studies focus on general project management practices and provide limited specific analysis of budget tracking and forecasting as drivers of financial performance in construction firms within the Greater Kampala Metropolitan Area.

Budgeting, forecasting, and actual financial performance are intertwined, with their relationship further strengthened by technological tools and modern analytical methods. Studies show that effective budgeting and forecasting increasingly rely on historical data, predictive analytics, and business intelligence tools to improve financial control and accuracy (Appelbaum, Kogan, Vasarhelyi, & Yan, 2017). Research on time-series forecasting and business intelligence applications demonstrates that data-driven forecasting reduces uncertainty, improves budget adherence, and informs strategic decisions (Grosu et al., 2023). Similarly, organisations with integrated forecasting systems are able to model future cash flows, predict cost overruns,

and allocate resources efficiently, thereby improving financial outcomes (Pavlatos & Kostakis, 2022). The integration of technology, therefore, enhances the reliability and precision of budget tracking and forecasting, enabling projects to be delivered within budget while minimizing risk and maximizing profitability. Advanced budgeting and forecasting practices are consequently important for construction companies operating within the Greater Kampala Metropolitan Area in achieving operational efficiency, financial stability, and strategic growth within a competitive and resource-intensive environment. However, there is limited empirical research on the adoption and financial impact of technology-enabled budgeting and forecasting practices among construction firms in Uganda, which this study seeks to address.

3. Methodology

The study used a cross-sectional survey design to collect data on asset management practices and financial performance among construction companies. This design was appropriate because it allows for exposures and outcomes to be measured simultaneously, providing a time-efficient and cost-effective way to test relationships (Setia, 2016; Wang & Cheng, 2020). The study was conducted in the Greater Kampala Metropolitan Area, which comprises a total of 380 registered construction firms. Using Krejcie and Morgan's (1970) sample size table, a sample of 191 companies was selected. Managers and head accountants were chosen as respondents because they are most knowledgeable about asset management and financial performance. Proportionate sampling was used to ensure fair representation of firms across Kampala, Wakiso, Mukono and Mpigi, following guidance from Etikan and Bala (2017) and Taherdoost (2017).

Primary data were collected using structured, self-administered questionnaires. Separate questionnaires were designed for finance managers and for field staff to ensure clarity and relevance to their roles (Dillman, Smyth, & Christian, 2014). To ensure quality, the study assessed both validity and reliability of the instruments. Content validity was assessed by experts and evaluated using the Content Validity Index, as recommended by De Vet, Mokkink, Terwee, and Knol (2011). Reliability was tested using Cronbach's Alpha following Mugenda and Mugenda (2003).

Data analysis followed a quantitative approach. The data were first coded and cleaned. Descriptive statistics, including means, frequencies, and standard deviations, were used to describe the characteristics of the respondents and the study variables. Inferential statistics, including correlation and regression analysis, were used to examine the relationships between asset management practices and financial performance. Statistical software such as SPSS provided accuracy and reliability in the analysis (Field, 2018).

4. Study Findings

Correlation matrix

Variables	ARA	RMS	BBF	NPM	ROE	FP
Asset register accessibility (ARA)	1					
Repair & maintenance scheduling (RMS)	.667**	1				
Budget Tracking & Forecasting (BBF)	-.071	.039	1			
Net Profit Margin (NPM)	.260**	.104	.143*	1		
Return on Equity (ROE)	.162**	.098	.115*	.412**	1	
Financial performance (FP)	.313**	.273**	.168**	.797**	.726**	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. The correlation is significant at the 0.05 level (two-tailed).

Asset Register Accessibility (ARA) and Financial Performance (FP): The correlation results indicate a positive and statistically significant relationship between asset register accessibility and financial performance ($r = 0.313$, $p < 0.01$). This suggests that any improvement in asset register accessibility is associated with a corresponding improvement in financial performance. This suggests that when construction companies

maintain updated, accurate, and easily accessible asset records, they are better able to control costs, allocate resources efficiently, and enhance profitability and overall financial outcomes.

Repair and Maintenance Scheduling (RMS) and Financial Performance (FP): The correlation results indicate a positive and statistically significant relationship between repair and maintenance scheduling and financial performance ($r = 0.273$, $p < 0.01$). This suggests that any improvement in maintenance scheduling practices is associated with a corresponding increase in financial performance. This indicates that firms that plan, schedule, and execute timely repairs minimize project delays, reduce equipment breakdown costs, and consequently achieve better profitability and financial stability.

Budget Tracking and Forecasting (BBF) and Financial Performance (FP): The correlation results indicate a positive and statistically significant relationship between budget tracking and forecasting, and financial performance ($r = .168$, $p < .01$). This suggests that any improvement in budget tracking and forecasting is associated with a corresponding enhancement in financial performance. This suggests that firms that consistently monitor expenditures, project future financial needs, and control budget deviations are more likely to maintain stable cash flow, avoid cost overruns, and enhance their overall financial performance.

Hierarchical Regression

Variable	Model 1			Model 2			Model 3			Model 4		
	B	SE	β	B	SE	β	B	SE	β	B	SE	β
Constant	3.17	0.09		2.52	0.14		2.42	0.16		1.92	0.22	
Are you a Certified Constructor?	0.09	0.06	0.088	0.06	0.05	0.062	0.07	0.05	0.066	0.06	0.05	
Type of Commercial Construction Project	0.09	0.04	.119*	0.09	0.04	.121*	0.09	0.04	.118*	0.07	0.04	
Asset Register Accessibility				0.23	0.04	.308**	0.17	0.05	.233**	0.19	0.05	
Repair and Maintenance Scheduling							0.08	0.05	0.113	0.06	0.05	
Budget Tracking and Forecasting										0.14	0.05	
R		0.147			0.341			0.351			0.387	
R^2		0.022			0.116			0.123			0.15	
Adjusted R^2		0.015			0.107			0.111			0.136	
R^2 Change		0.022			0.094			0.007			0.027	
F Change		3.347			32.251			2.426			9.421	
Sig. F Change		0.036			0			0.12			0.002	

The results of Model 1 indicate that the control variables (certification status and type of commercial construction project) account for 1.5 percent of the variation in financial performance (Adjusted $R^2 = 0.015$). Among the two variables, only the type of commercial construction project is a significant predictor of financial performance ($\beta = .119$, $p < .05$). This indicates that firms involved in certain categories of commercial projects tend to achieve better financial outcomes. Certification status does not significantly influence financial performance, suggesting that being a certified constructor alone does not lead to improved financial results.

Model 2 shows that adding asset register accessibility increases the explained variance by 9.4% (R^2 change = 0.094; $F\Delta = 32.251$; $p < 0.001$). The results reveal a positive and statistically significant relationship between asset register accessibility and financial performance ($\beta = .308$; $p < .001$). This means that firms with updated, accurate, and accessible asset registers tend to perform better financially. The increase in explained variance indicates that asset record accessibility plays a significant role in enhancing profitability, resource utilization, and operational efficiency.

When repair and maintenance scheduling is introduced in Model 3, it increases the variance explained by only 0.7 percent (R^2 change = .007; $F\Delta = 2.426$; $p = .120$), which is not statistically significant. Although the coefficient for repair and maintenance scheduling is positive ($\beta = .113$), it does not significantly predict financial performance in the presence of other asset management practices. Asset register accessibility remains

significant, although its beta value decreases from 0.308 to 0.233, suggesting that its influence overlaps partially with maintenance-related activities.

Model 4 adds budget tracking and forecasting, contributing an additional 2.7% to the explained variance (R^2 change = 0.027; FΔ = 9.421; p = 0.002). The results reveal a positive and significant relationship between budget tracking and forecasting, and financial performance (β = .14; p < .01). This indicates that firms that consistently monitor budgets, track expenditures, and utilize financial forecasts tend to experience better financial performance. At this stage, asset register accessibility remains significant, while repair and maintenance scheduling is insignificant, indicating that budgeting practices play a more important role in predicting financial outcomes.

Overall, the four models explain 15% of the variation in financial performance (R^2 = 0.150). Of this total, control variables contribute 1.5 percent, asset register accessibility contributes 9.4 percent, repair and maintenance scheduling contributes 0.7 percent (insignificant), and budget tracking and forecasting contribute 2.7 percent. These results indicate that asset register accessibility is the strongest predictor of financial performance, followed by budget tracking and forecasting. Repair and maintenance scheduling shows a positive but weak and non-significant influence, suggesting that companies benefit more from strong asset record systems and effective budget management than from maintenance scheduling alone.

5. Conclusion and Recommendations

Conclusion

The hierarchical regression results indicate that asset management practices have a significant impact on the financial performance of construction companies in the Greater Kampala Metropolitan Area. Asset register accessibility emerged as the strongest predictor, explaining the largest increase in variance when introduced into the model. This suggests that firms with accurate, accessible, and well-maintained asset records are better positioned to achieve improved financial outcomes. Budget tracking and forecasting also demonstrated a positive and significant impact on financial performance, indicating that consistent budget monitoring and forward-looking financial planning enhance profitability and operational stability. Although repair and maintenance scheduling had a positive direction, it did not significantly predict financial performance when other asset management components were included, suggesting that maintenance scheduling alone may not generate substantial financial benefits without robust asset records and effective financial controls. Overall, the models explained 15% of the variation in financial performance, underscoring the importance of structured asset management practices in enhancing firm-level financial results.

Recommendations

Based on the findings, construction firms should place greater emphasis on improving the accessibility and accuracy of their asset registers, as this was the strongest determinant of financial performance in the study. Firms should also strengthen their budgeting, tracking, and forecasting systems to support better financial planning and resource allocation. Furthermore, while repair and maintenance scheduling alone did not significantly influence financial outcomes, integrating it with improved asset record systems and financial tracking may enhance its effectiveness. By prioritizing these areas, construction firms can build more efficient asset management frameworks that support profitability, reduce inefficiencies, and improve long-term financial performance across the industry.

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Modeling Premature Adult Mortality From Non-Communicable Diseases in the United States

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Abstract: We model mortality from cardiovascular diseases (CVD), cancer, diabetes, and chronic respiratory diseases (CRD) among individuals aged 30–70 years in the United States using quarterly time-series data covering the period 2000 to 2024. We adopt an autoregressive integrated moving average (ARIMA) framework to examine both the long-run trajectory and short-run fluctuations in premature adult mortality. Quarterly data obtained from the World Bank are employed, with mortality from CVD, cancer, diabetes, or CRD specified as the dependent variable, while autoregressive (AR) and moving average (MA) terms capture the inherent temporal dependence in mortality dynamics. Parameter estimation is conducted using the conditional least squares (CLS) technique. Results reveal a positive and statistically significant AR(1) coefficient of 0.987144, indicating strong persistence and inertia in mortality patterns, whereby current mortality outcomes are heavily influenced by their past realizations. In contrast, the MA(4) coefficient is negative and statistically significant at −0.697195, suggesting that short-run shocks to mortality, such as transitory health crises or policy interventions are gradually corrected over time. This dynamic adjustment mechanism reinforces the tendency of the series to revert toward its long-run path. The estimated ARIMA(1,1,4) model satisfies both covariance stationarity and invertibility conditions, confirming its econometric soundness and suitability for forecasting. The adjusted R-squared value of 0.835857 indicates that approximately 83.6% of the variation in premature adult mortality is explained by the model's dynamic structure, underscoring its strong explanatory power. Out-of-sample forecasts extending to 2050 project a sustained and gradual decline in mortality rates, with levels converging toward approximately 4% by mid-century. These projections are consistent with ongoing improvements in healthcare access, disease prevention strategies, medical technology, and public health interventions in the United States. The study recommends sustained and targeted investments in non-communicable disease prevention, early diagnosis, and health system resilience to consolidate and accelerate the observed long-term decline in premature adult mortality.

Keywords: *ARIMA, premature adult mortality, non-communicable diseases, United States*

1. Introduction

Non-communicable diseases (NCDs) constitute the leading cause of mortality worldwide, accounting for over 70 percent of global deaths, with cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes being the principal contributors (WHO, 2023). Premature mortality from NCDs, defined as deaths occurring between exact ages 30 and 70 years has emerged as a critical public health indicator, reflecting both the effectiveness of health systems and broader socioeconomic conditions. While high-income countries have historically achieved substantial reductions in premature mortality, recent evidence suggests that progress has slowed or reversed in several advanced economies, notably the United States.

The United States exhibits a distinctive and troubling pattern of premature adult mortality from NCDs. Despite having one of the highest per capita healthcare expenditures globally, the country continues to experience elevated mortality rates from preventable and manageable chronic diseases relative to peer nations (OECD, 2022). Cardiovascular diseases and cancers remain dominant causes of premature death, while diabetes and chronic respiratory diseases have shown persistent or rising trends, driven by obesity, sedentary lifestyles, unhealthy diets, tobacco use, and environmental exposures (CDC, 2023). These health challenges are exacerbated by pronounced socioeconomic and geographic inequalities, uneven access to preventive and primary healthcare, and disparities linked to income, race, and education (Woolf & Schoomaker, 2019).

Premature mortality from NCDs imposes high economic and social costs on the United States. Deaths occurring during prime working ages reduce labor productivity, increase dependency burdens, and generate substantial losses in human capital. Beyond direct healthcare expenditures, the indirect costs associated with lost earnings,

reduced economic output, and long-term disability place additional strain on households and public finances (Bloom et al., 2011). Consequently, reducing premature adult mortality from NCDs is not only a public health priority but also a key development and macroeconomic concern.

Although an extensive body of literature documents NCD prevalence and mortality patterns in the United States, much of the existing research remains largely descriptive or cross-sectional. Limited attention has been devoted to formal econometric and time-series modeling of premature adult mortality, particularly using high-frequency data capable of capturing short-term dynamics, trend shifts, and structural changes over time. Moreover, few studies provide robust forecasts of premature NCD mortality, despite their importance for forward-looking health policy, resource allocation, and evaluation of long-term disease prevention strategies. This represents a critical empirical gap, especially in the context of evolving demographic structures, behavioral risk profiles, and health system pressures.

The persistence of high premature adult mortality from non-communicable diseases in the United States, therefore, constitutes a major research problem. Without rigorous modeling and reliable forecasts, policymakers may underestimate future disease burdens and fail to implement timely, evidence-based interventions. Addressing this gap is essential for assessing progress toward national health objectives and global commitments, including the Sustainable Development Goal target of reducing premature mortality from NCDs by one-third.

Against this backdrop, we seek to model premature adult mortality from non-communicable diseases in the United States, focusing on deaths between ages 30 and 70 years. By employing a robust empirical modeling framework and generating forward-looking projections, we aim to deepen understanding of mortality dynamics, identify emerging trends, and provide actionable evidence to support effective NCD prevention and control policies. In doing so, our study contributes to the growing literature on mortality modeling and offers valuable insights for strengthening population health outcomes in the United States.

2. Literature Review

Globally, NCDs are the dominant cause of premature adult mortality, responsible for approximately 74% of all deaths, with cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes accounting for the largest share (WHO, 2023). Premature mortality, deaths occurring between ages 30 and 70, is widely used as a benchmark for assessing health system performance and progress toward international development goals, including the Sustainable Development Goals (SDG 3.4).

Empirical studies at the global level emphasize the role of behavioral risk factors such as tobacco use, unhealthy diets, physical inactivity, and harmful alcohol consumption in driving premature NCD mortality (Beaglehole et al., 2011; Murray et al., 2020). However, recent research highlights that risk exposure alone does not fully explain cross-country differences. Structural factors such as income inequality, urbanization, environmental pollution, and health system capacity significantly mediate mortality outcomes (Collaborators & Ärnlöv, 2020).

From a methodological standpoint, global studies have increasingly applied demographic and epidemiological models to analyze mortality trends. Nonetheless, many analyses rely on low-frequency (annual) data and focus on descriptive trend comparisons rather than dynamic modeling and forecasting (Global, 2017). This limits their ability to capture short-term fluctuations, structural breaks, and evolving disease trajectories, underscoring the need for more advanced modeling approaches.

Within high-income regions, including OECD countries, premature mortality from NCDs has generally declined over the past decades, largely due to improvements in medical technology, early diagnosis, and public health interventions (OECD, 2022). However, substantial heterogeneity persists across countries. Several studies document that the United States consistently underperforms relative to peer nations, particularly in mortality from cardiovascular diseases and diabetes (Ho & Hendi, 2018).

Regional comparative studies attribute these disparities to differences in healthcare access, preventive care utilization, and social protection mechanisms (Avendano & Kawachi, 2014). Unlike many OECD countries with

universal health coverage, fragmented healthcare financing systems have been linked to delayed diagnosis and poor chronic disease management, contributing to higher premature mortality.

Despite these insights, much of the regional literature remains cross-sectional or comparative in nature. Limited emphasis is placed on time-series or forecasting models that can inform future health system planning. Consequently, the capacity of existing studies to guide long-term NCD mortality reduction strategies remains constrained.

The United States has experienced persistently high levels of premature adult mortality from NCDs, even during periods of overall economic growth and rising healthcare expenditure (Woolf & Schoomaker, 2019). Cardiovascular diseases and cancers remain the leading causes, while diabetes-related mortality has shown worrying increases, closely linked to rising obesity and metabolic disorders (CDC, 2023).

Several U.S.-based studies highlight the role of socioeconomic inequality, racial and ethnic disparities, and geographic variation in shaping mortality outcomes (Case & Deaton, 2021). Populations with lower income and educational attainment face higher exposure to NCD risk factors and lower access to quality preventive care, resulting in disproportionate premature mortality burdens.

Methodologically, U.S. studies have largely focused on descriptive epidemiology and regression-based risk factor analysis. While these approaches are valuable, they often fail to capture the dynamic evolution and future trajectory of premature mortality. There is limited application of advanced time-series or forecasting models particularly those using high-frequency data to project NCD mortality and assess future policy implications. This constitutes a critical empirical gap that our study seeks to address.

Our study is anchored in the Epidemiological Transition Theory, which explains shifts in mortality patterns from infectious diseases to chronic, non-communicable diseases as societies undergo economic development, urbanization, and demographic change (Omran, 1998). In advanced economies such as the United States, this theory predicts a dominance of NCD-related mortality, particularly among adults in productive age groups.

Complementing this is the Health Production Function Theory, which conceptualizes health outcomes as a function of individual behaviors, socioeconomic conditions, environmental factors, and healthcare inputs (Grossman, 1972). According to this framework, premature mortality from NCDs reflects inefficiencies in health investment, preventive behavior, and access to effective medical care.

Together, these theories provide a foundation for modeling mortality as a dynamic outcome influenced by evolving risk factors and systemic conditions, justifying the use of quantitative modeling and forecasting techniques.

Conceptually, premature adult mortality from non-communicable diseases (NCDs) is specified as the dependent variable, measured as the probability (percentage) of death between exact ages 30 and 70 from cardiovascular diseases, cancers, diabetes, and chronic respiratory diseases. Mortality outcomes reflect the cumulative and dynamic influence of behavioral risk factors (such as tobacco use, physical inactivity, and unhealthy diets), socioeconomic conditions (including income inequality, education, and labor market status), health system characteristics (notably access to quality and preventive care), and demographic dynamics (particularly population aging and urbanization). Rather than modeling these determinants explicitly, their combined and lagged effects are captured through the stochastic structure of the mortality series itself. Accordingly, autoregressive (AR) and moving average (MA) components are employed to model persistence, inertia, and short-term shocks in mortality trends. The ARIMA framework is therefore well-suited for capturing historical dynamics and generating reliable forecasts of premature adult NCD mortality, providing an empirical basis for monitoring progress and informing health policy design and evaluation in the United States (Box & Jenkins, 1976; WHO, 2014; Hyndman & Athanasopoulos, 2021; Nahabwe & Maniple, 2025).

3. Data and Methods

We adopt a quantitative, longitudinal time-series research design to model and forecast premature adult mortality from NCDs in the United States. The design is appropriate for analyzing temporal dynamics and identifying underlying stochastic patterns in mortality outcomes over time. Time-series modeling enables the examination of persistence, trends, and shocks in mortality data, while providing a robust basis for generating forward-looking projections critical for health policy planning and evaluation (Box et al., 2015; Nahabwe & Maniple, 2025).

We focus on premature adult mortality, defined as the probability of dying between the ages of 30 and 70 years from cardiovascular diseases, cancers, diabetes, and chronic respiratory diseases. This indicator is widely used in epidemiological and policy-oriented research to assess the effectiveness of NCD prevention and control strategies (WHO, 2023).

We utilize secondary mortality data for the United States covering the period 2000 to 2024, obtained from internationally recognized health databases, including the World Health Organization (WHO) and the World Bank. These sources provide standardized and comparable mortality indicators that ensure data reliability and consistency over time (World Bank, 2024).

Given the time-series nature of the study, the sample consists of the complete population of annual observations within the study period rather than a subset. This census-based approach eliminates sampling bias and maximizes the informational content of the data (Enders, 2015; Kagarura et al., 2025). To enhance the model's ability to capture short-term dynamics and improve forecasting precision, the annual mortality series is converted to quarterly frequency using a temporal disaggregation technique. Quarterly transformation allows for richer dynamic structure and increased degrees of freedom, which are essential for robust ARIMA estimation and improved out-of-sample forecasts (Denton, 1971; Chow & Lin, 197; Kagarura & Nahabwe, 2025).

The annual-to-quarterly conversion is conducted using established temporal disaggregation methods that preserve the underlying annual totals while distributing observations smoothly across quarters. This approach ensures that the generated quarterly series remains consistent with the original data-generating process and avoids artificial volatility (Sax & Steiner, 2013; Nahabwe & Kagarura, 2025).

Before model estimation, the transformed series is subjected to standard pre-estimation diagnostics. Stationarity is assessed using unit root tests to determine the appropriate order of differencing required for ARIMA modeling (Dickey & Fuller, 1979; Kagarura & Nahabwe, 2025). Descriptive statistics and visual inspections are also employed to identify trends, volatility clustering, and potential structural shifts in premature NCD mortality.

The core analytical tool employed in this study is the Autoregressive Integrated Moving Average (ARIMA) model. ARIMA models are well-suited for univariate time-series analysis where the objective is to capture temporal dependence and generate accurate forecasts based solely on the historical behavior of the series (Box et al., 2015; Nahabwe & Kagarura, 2025). The general form of an ARIMA(p,d,q) model is expressed as:

$$Y_t = c + \sum_{i=1}^{p} \boldsymbol{\phi}_i Y_{t-i} + \sum_{j=1}^{q} \theta_j \varepsilon_{t-j} + \varepsilon_t \quad \text{..... (1)}$$

Where;
Y_t is Mortality from CVD, cancer, diabetes or CRD between exact ages 30 and 70 (%) at time t
c is a constant term
ε_t is white noise at time t
$\boldsymbol{\phi}_i$ are the coefficients of the autoregressive terms
θ_j are the coefficients of the moving average terms
p = Number of lagged AR terms
d = Number of differences required to make the series stationary
q = Number of lagged MA terms (Box & Jenkins 1976; Nahabwe & Maniple, 2025; Kagarura et al., 2025)

We estimate parameters using conditional least squares (CLS) method. CLS is widely used in ARIMA estimation due to its computational efficiency and robustness in finite samples, particularly when the sample size is moderate and the likelihood function is complex (Brockwell & Davis, 2002). CLS minimizes the sum of squared residuals conditional on initial observations, providing consistent and asymptotically efficient parameter estimates under standard regularity conditions. Compared to exact maximum likelihood estimation, CLS is less sensitive to initial value assumptions and is well-suited for high-frequency time-series data generated through temporal disaggregation (Hamilton, 1994; Kagarura & Nahabwe, 2025). CLS estimator for the regression coefficients is given by the following formula:

$$\hat{\theta} = \underset{\theta}{\operatorname{argmin}}[\sum_{t=1}^{n}(y_t - \hat{y}_t(\theta))^2] \quad \ldots\ldots (2)$$

Where:
$\hat{\theta}$ represents the estimated parameter vector (which includes both AR and MA parameters in ARIMA).
y_t represents the actual observed value of the dependent variable at time t
$\hat{y}_t(\theta)$ represents the model's predicted value at time t based on the parameter estimates, where θ
n is the number of observations. (Hamilton, 1994; Nahabwe & Kagarura, 2025).

Post-estimation diagnostics are conducted to validate the adequacy of the fitted ARIMA model. Residual autocorrelation is examined using the Ljung–Box Q-statistic, while model stability and forecast accuracy are evaluated through in-sample fit and out-of-sample forecasting performance (Ljung & Box, 1978; Kagarura & Nahabwe, 2025).

The validated model is then used to generate short- to medium-term forecasts of premature adult mortality from NCDs. These projections provide empirical evidence on future mortality trajectories, offering valuable insights for health system planning, preventive interventions, and policy formulation aimed at reducing premature deaths.

The choice of a time-series design and ARIMA modeling framework is motivated by the study's objective to understand and forecast mortality dynamics rather than identify causal determinants. The conversion of annual data to quarterly frequency enhances model flexibility and forecast precision, while the use of conditional least squares ensures reliable estimation in the presence of complex temporal dependence. Together, these methodological choices provide a robust and policy-relevant approach to modeling premature adult mortality from NCDs in the United States.

4. Results and Discussion

Appendix 1 presents descriptive statistics for premature adult mortality from cardiovascular diseases (CVDs), cancer, diabetes, and chronic respiratory diseases (CRDs) among individuals aged 30–70 years in the United States.

The mean premature mortality rate over the study period is 14.82 percent, with a median of 14.2 percent, indicating a relatively high and persistent burden of non-communicable diseases among adults in their most productive years. The mortality rate ranges from a minimum of 13.2 percent to a maximum of 17.8 percent, reflecting notable temporal variation in NCD-related mortality. The standard deviation of 1.34 suggests moderate dispersion around the mean, implying that while mortality rates fluctuate over time, they remain consistently elevated.

The positive skewness value (0.92) indicates a right-skewed distribution, suggesting occasional spikes in premature mortality, while the kurtosis value (2.52) implies a slightly flatter distribution than the normal curve. The Jarque–Bera statistic (15.06, $p < 0.05$) rejects the null hypothesis of normality, indicating that the mortality series is not normally distributed. Such non-normality is common in health and mortality time-series data due to structural changes, shocks, and persistence effects (Enders, 2015; Wooldridge, 2019; Nahabwe & Maniple, 2025).

Stationarity test using Augmented Dickey-Fuller shows the original Mortality from CVD, cancer, diabetes or CRD between exact ages 30 and 70 (%) series is non-stationary ($p > 0.05$) but achieves stationarity upon first differencing ($p < 0.05$). Consequently, the ARIMA(1,1,4) model is identified as the best fit based on model selection criteria (AIC = -1.773579; SC = -1.666048; H-QC = -----1.730128) (Nahabwe & Kagarura, 2025).

The model output is estimated as:
Results of ARIMA(1,1,4) model (Appendix 4)

$Mortality\ from\ CVD, \widehat{cancer}, diabetes\ or\ CRD_{\ t}$ = 0.063186 + 0.987144AR(1) - 0.697195MA(4) …… (3)

Hence,

$$\hat{\theta}_{CLS} = \begin{bmatrix} 0.063186 \\ 0.987144 \\ -0.697195 \end{bmatrix}$$

ARIMA(1,1,4) estimation results provide insights into the dynamic behavior of premature adult mortality from NCDs. The constant term (C = 0.063186, p = 0.7384) is statistically insignificant, indicating the absence of a deterministic component in the mortality process. This suggests that beyond stochastic fluctuations, there is no systematic underlying trend in premature mortality, inconsistent with long-term epidemiological transitions in advanced economies (Lee & Carter, 1992).

Autoregressive term AR(1) has a coefficient of 0.987144 and is statistically significant at the 1 percent level (p = 0.0000). This high coefficient indicates strong persistence in premature NCD mortality, implying that current mortality levels are heavily influenced by past outcomes. Such persistence reflects the chronic nature of NCDs and the cumulative effects of long-term exposure to behavioral and socioeconomic risk factors (WHO, 2023).

Similarly, the moving average term MA(4) is statistically significant (−0.697195, p = 0.0000), capturing short-term adjustments and shocks in mortality dynamics. The negative sign suggests a corrective mechanism whereby short-run shocks to mortality tend to be partially offset in subsequent periods, stabilizing the series over time. This finding is consistent with the presence of delayed health system responses and behavioral adaptations following mortality fluctuations (Hamilton, 1994; Nahabwe & Maniple, 2025).

The adjusted R-squared value of 0.835857 indicates that approximately 84 percent of the variation in premature adult mortality is explained by the model. This reflects a strong explanatory power and confirms the suitability of the ARIMA framework for modeling mortality dynamics (Box et al., 2015; Kagarura et al. 2025).

Durbin–Watson statistic of 2.048026 is close to the theoretical benchmark of 2, indicating the absence of first-order autocorrelation in the residuals (Wooldridge, 2019; Nahabwe & Kagarura, 2025; Nahabwe, 2025). This suggests that the model sufficiently captures the serial dependence inherent in the mortality series.

Although the residuals are not normally distributed (Jarque–Bera = 351.2, p = 0.000), the Ljung–Box Q statistic (p = 0.675) fails to reject the null hypothesis of no autocorrelation. This confirms that the residuals behave like white noise, satisfying a key requirement for ARIMA model adequacy (Nahabwe & Kagarura, 2025; Nahabwe, 2025). In time-series forecasting, residual normality is less critical than independence and zero mean, particularly when the objective is prediction rather than hypothesis testing (Enders, 2015; Kagarura & Nahabwe, 2025).

Furthermore, the AR and MA roots lie within the unit circle (Appendix 6), confirming that the model is stable and stationary, and that shocks to premature mortality dissipate over time. This reinforces the reliability of the model for forecasting purposes (Munyambonera et al., 2025; Kagarura et al., 2025).

Model simulations extending to 2050 (Appendix 8) project a gradual decline in premature adult mortality from NCDs, reaching approximately 4 percent by 2050. This projected decline suggests potential long-term gains

from improvements in medical technology, early detection, and public health interventions. However, the slow pace of decline underscores the persistent nature of NCD risk factors and the need for sustained preventive efforts.

The findings of our study are broadly consistent with existing literature that emphasizes the high persistence and slow adjustment of NCD-related mortality in high-income countries (Lee & Carter, 1992; Woolf & Schoomaker, 2019). The strong AR(1) coefficient aligns with global evidence that chronic disease mortality responds gradually to policy interventions and behavioral change (GBD 2019 Collaborators, 2020).

Compared to earlier U.S.-based studies that rely largely on descriptive or regression-based approaches (CDC, 2023), this study provides unique empirical evidence through dynamic time-series modeling and long-term forecasting. The use of quarterly data enhances sensitivity to short-term mortality fluctuations, while the ARIMA–CLS framework captures both persistence and shock correction mechanisms.

A particularly novel contribution of our study lies in its forecast horizon to 2050, which offers forward-looking insights rarely addressed in prior research. While previous studies highlight stagnation or slow improvement in U.S. premature mortality trends, our study suggests a gradual decline, contingent on sustained health system performance and preventive policies. This divergence underscores the importance of modeling techniques in shaping expectations about future health outcomes.

Overall, the results demonstrate that although premature adult mortality from NCDs in the United States is projected to decline, its strong persistence implies that without aggressive and sustained interventions, reductions will remain slow. The findings therefore reinforce the urgency of comprehensive NCD prevention strategies targeting behavioral risks, health inequalities, and access to quality care.

Limitations

Despite its methodological rigor, our study is subject to several limitations related to its research design, data structure, and analytical approach, which should be considered when interpreting the findings.

Firstly, we adopt a univariate time-series design, focusing exclusively on historical patterns of premature adult mortality from NCDs. While this approach is appropriate for modeling temporal dynamics and forecasting, it does not explicitly incorporate explanatory covariates such as socioeconomic conditions, behavioral risk factors, healthcare access, or policy interventions. Consequently, the ARIMA framework captures correlations over time rather than causal mechanisms, limiting the ability to attribute observed mortality trends to specific determinants (Box et al., 2015; Enders, 2015; Nahabwe & Kagarura, 2025).

Secondly, although our study utilizes nationally aggregated mortality data for the United States, such aggregation may mask important subnational and demographic heterogeneity. Variations in premature NCD mortality across regions, income groups, racial and ethnic populations, and gender are well documented in the literature (Woolf & Schoomaker, 2019). The use of aggregate data, therefore, constrains the study's capacity to capture localized mortality dynamics and inequities that could influence overall trends and forecasts.

Thirdly, the transformation of annual data into quarterly frequency introduces an inherent limitation. While temporal disaggregation enhances the dynamic structure of the series and improves forecasting flexibility, the generated quarterly observations are model-based estimates rather than directly observed data. As such, they may smooth or distort short-term fluctuations, potentially affecting parameter estimates and forecast precision (Chow & Lin, 1971; Sax & Steiner, 2013). Although established disaggregation techniques were employed, the resulting quarterly series should be interpreted with caution.

Fourthly, the estimation of the ARIMA model using conditional least squares (CLS), while computationally efficient and suitable for moderate sample sizes, may be less statistically efficient than exact maximum likelihood estimation under certain conditions. CLS estimates can be sensitive to model specification and initial values, particularly in highly persistent series such as mortality data (Hamilton, 1994; Brockwell & Davis, 2002; Nahabwe & Kagarura, 2025). This limitation may influence the magnitude of estimated parameters, although it is unlikely to alter the overall dynamic pattern captured by the model.

Fifthly, our study assumes structural stability over the forecast horizon, an assumption that may not hold in the presence of unforeseen shocks such as major health policy reforms, technological breakthroughs, pandemics, or significant changes in population behavior. Mortality trends are susceptible to structural breaks that standard ARIMA models may fail to capture, potentially reducing forecast accuracy in the long term (Perron, 2006; Nahabwe & Kagarura, 2025).

Finally, although diagnostic tests confirm that the residuals behave like white noise, the non-normal distribution of residuals suggests the presence of extreme values or unmodeled nonlinearities. While non-normality does not invalidate ARIMA-based forecasts, it may affect statistical inference and confidence interval construction (Wooldridge, 2019; Nahabwe & Kagarura, 2025).

5. Conclusion and Recommendations

We set out to model and forecast premature adult mortality from NCDs in the United States, with a focus on deaths occurring between ages 30 and 70 years. By applying a rigorous time-series framework to transformed high-frequency data, we provide a comprehensive assessment of the dynamic behavior and long-term trajectory of NCD-related mortality. Taken together, our findings demonstrate that premature adult mortality from NCDs in the United States is governed by strong temporal persistence, gradual adjustment processes, and long-run structural forces rather than short-lived fluctuations.

At a broader level, we confirm that mortality outcomes from chronic diseases evolve slowly and are deeply embedded in long-term epidemiological, behavioral, and health system dynamics. This underscores the limited effectiveness of short-term interventions and highlights the importance of sustained, cumulative investments in prevention, early detection, and chronic disease management. In line with the epidemiological transition and health production theories, we reinforce the view that improvements in population health outcomes require continuous and coordinated policy efforts rather than episodic responses (Omran, 1998; Grossman, 1972).

A key contribution of our research lies in its methodological approach. By converting annual mortality data into quarterly frequency and employing an ARIMA modeling framework estimated through conditional least squares, we enhance sensitivity to temporal dynamics and strengthen the reliability of long-term forecasts. This approach advances existing literature, which has largely relied on descriptive analyses or low-frequency data, by offering a forward-looking perspective that is critical for health planning and policy evaluation (Box et al., 2015; Enders, 2015; Nahabwe & Kagarura, 2025).

From a policy standpoint, our conclusions suggest that meaningful reductions in premature adult mortality from NCDs in the United States are achievable but contingent upon sustained structural reforms. These include strengthening preventive healthcare systems, addressing socioeconomic inequalities, and promoting long-term behavioral change. The projected mortality trajectory further emphasizes that progress will be incremental, reinforcing the urgency of early and sustained intervention to avoid avoidable loss of life and economic productivity.

Recommendations

Based on the empirical modeling and long-term projections of premature adult mortality from NCDs in the United States, we propose the following recommendations, which are aligned with the study's findings and broader public health evidence.

Firstly, the strong persistence observed in premature NCD mortality dynamics underscores the need for long-term, structurally embedded health policies rather than short-term or episodic interventions. Policymakers should prioritize sustained investments in preventive healthcare, particularly policies that promote early screening, risk-factor modification, and continuity of care for chronic diseases. Evidence suggests that consistent policy commitment over extended periods is more effective in reducing premature mortality than isolated policy reforms (WHO, 2023; Woolf & Schoomaker, 2019; Nahabwe & Maniple, 2025).

Secondly, the gradual decline projected in premature mortality highlights the importance of addressing upstream socioeconomic determinants of health. Policies aimed at reducing income inequality, improving

educational attainment, and enhancing food and environmental regulation are essential for accelerating mortality reductions. Integrating NCD prevention objectives into broader social and economic policies can yield long-term health gains that are not achievable through healthcare interventions alone (Marmot et al., 2020).

Thirdly, given the forecast horizon extending to mid-century, national health strategies should explicitly incorporate long-term mortality projections into planning and budgeting processes. Embedding forecasting evidence into policy design can improve resource allocation, strengthen preparedness for future disease burdens, and enhance accountability in achieving national and global health targets (OECD, 2022).

At the program level, our findings support the expansion of integrated and continuous NCD prevention programs targeting adults in early and mid-life stages. Since mortality outcomes exhibit strong dependence on past health trajectories, interventions that begin earlier in the life course such as workplace wellness programs, community-based physical activity initiatives, and nutrition education are likely to generate larger long-term benefits (Beaglehole et al., 2011).

Additionally, health programs should adopt data-driven monitoring frameworks that utilize high-frequency mortality and morbidity indicators. The use of quarterly or near-real-time data can improve the timeliness of program evaluation and enable rapid adjustment to emerging trends, thereby enhancing program effectiveness and sustainability (Box et al., 2015; Nahabwe & Kagarura, 2025).

Programs aimed at reducing premature adult mortality should emphasize equity-oriented implementation, ensuring that vulnerable and underserved populations benefit proportionately. Given the documented disparities in NCD outcomes across socioeconomic and demographic groups, targeted program delivery can help close mortality gaps and accelerate overall progress (CDC, 2023).

From a research perspective, our study highlights the need for multivariate and structural modeling approaches that extend beyond univariate time-series frameworks. Future studies could integrate socioeconomic variables, behavioral risk factors, and health system indicators to better explain the drivers of mortality dynamics and to support causal inference (Enders, 2015; Wooldridge, 2019).

Further research could also explore disaggregated mortality modeling, including analyses by region, gender, race, and income group, to uncover heterogeneous trends that are masked in national aggregates. Such disaggregation is critical for designing targeted interventions and improving health equity (Woolf & Schoomaker, 2019; Nahabwe & Maniple, 2025).

Finally, methodological advancements such as regime-switching models, structural break tests, and machine-learning-based forecasting techniques could be employed to assess the robustness of long-term mortality projections under alternative scenarios. Comparative forecasting studies would enhance confidence in projected trends and inform adaptive policy responses to future uncertainties (Hamilton, 1994; Perron, 2006; Nahabwe & Maniple, 2025).

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APPENDICES

Appendix 1: Descriptive statistics

	Mortality from CVD, cancer, diabetes or CRD between exact ages 30 and 70 (%)
Mean	14.82
Median	14.2
Maximum	17.8
Minimum	13.2
Std. Dev.	1.343296
Skewness	0.919959
Kurtosis	2.522057
Jarque-Bera	15.05721
Probability	0.000537
Sum	1482
Sum Sq. Dev.	178.64
Observations	100

Appendix 2: Unit root test, Mortality from CVD, cancer, diabetes or CRD between exact ages 30 and 70 (%) (in Level)

Null Hypothesis: MORTALITY_FROM_CVD__CANCER__DIABETES_OR_CRD has a unit root
Exogenous: None
Lag Length: 4 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.391376	0.1517
Test critical values:	1% level	-2.589531	
	5% level	-1.944248	
	10% level	-1.614510	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MORTALITY_FROM_CVD__CANCER__DIABETES_OR_CRD)
Method: Least Squares
Date: 12/31/25 Time: 16:44
Sample (adjusted): 2001Q2 2024Q4
Included observations: 95 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MORTALITY_FROM_CVD__CANCER__DIABETES_OR_CRD(-1)	-0.001213	0.000872	-1.391376	0.1675
D(MORTALITY_FROM_CVD__CANCER__DIABETES_OR_CRD(-1))	-0.041518	0.079468	-0.522446	0.6026
D(MORTALITY_FROM_CVD__CANCER__DIABETES_OR_CRD(-2))	-0.041518	0.079468	-0.522446	0.6026
D(MORTALITY_FROM_CVD__CANCER__DIABETES_OR_CRD(-3))	-0.041518	0.079468	-0.522446	0.6026
D(MORTALITY_FROM_CVD__CANCER__DIABETES_OR_CRD(-4))	0.598879	0.079999	7.486123	0.0000

R-squared	0.417458	Mean dependent var	-0.035789
Adjusted R-squared	0.391568	S.D. dependent var	0.124555
S.E. of regression	0.097156	Akaike info criterion	-1.773809

Sum squared resid	0.849530	Schwarz criterion	-1.639394
Log likelihood	89.25592	Hannan-Quinn criterion.	-1.719495
Durbin-Watson stat	1.958066		

Appendix 3: Unit root test, Mortality from CVD, cancer, diabetes or CRD between exact ages 30 and 70 (%) (in First difference)

Null Hypothesis: D(MORTALITY_FROM_CVD__CANCER__DIABETES_OR_CRD) has a unit root
Exogenous: None
Lag Length: 3 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.418726	0.0158
Test critical values:	1% level	-2.589531	
	5% level	-1.944248	
	10% level	-1.614510	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MORTALITY_FROM_CVD__CANCER__DIABETES_OR_CRD,2)
Method: Least Squares
Date: 12/31/25 Time: 16:53
Sample (adjusted): 2001Q2 2024Q4
Included observations: 95 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MORTALITY_FROM_CVD__CANCER__DIABETES_OR_CRD(-1))	-0.358382	0.148170	-2.418726	0.0176
D(MORTALITY_FROM_CVD__CANCER__DIABETES_OR_CRD(-1),2)	-0.641618	0.128349	-4.998997	0.0000
D(MORTALITY_FROM_CVD__CANCER__DIABETES_OR_CRD(-2),2)	-0.641618	0.104847	-6.119555	0.0000
D(MORTALITY_FROM_CVD__CANCER__DIABETES_OR_CRD(-3),2)	-0.641618	0.074245	-8.641914	0.0000

R-squared	0.738481	Mean dependent var	0.004211
Adjusted R-squared	0.729859	S.D. dependent var	0.187886
S.E. of regression	0.097654	Akaike info criterion	-1.773579
Sum squared resid	0.867803	Schwarz criterion	-1.666048
Log likelihood	88.24502	Hannan-Quinn criterion.	-1.730128
Durbin-Watson stat	2.000000		

Appendix 4: Results of ARIMA(1,1,4) model

Dependent Variable: D(MORTALITY_FROM_CVD__CANCER__DIABETES_OR_CRD)
Method: ARMA Conditional Least Squares (Gauss-Newton / Marquardt steps)
Date: 12/31/25 Time: 17:18
Sample (adjusted): 2000Q3 2024Q1
Included observations: 95 after adjustments
Failure to improve likelihood (non-zero gradients) after 13 iterations
Coefficient covariance computed using the outer product of gradients
MA Backcast: 1999Q3 2000Q2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.063186	0.188590	0.335046	0.7384
AR(1)	0.987144	0.022154	44.55825	0.0000
MA(4)	-0.697195	0.078977	-8.827805	0.0000

R-squared	0.839350	Mean dependent var	-0.038947
Adjusted R-squared	0.835857	S.D. dependent var	0.054665
S.E. of regression	0.022147	Akaike info criterion	-4.751143
Sum squared resid	0.045126	Schwarz criterion	-4.670495
Log likelihood	228.6793	Hannan-Quinn criterion.	-4.718555
F-statistic	240.3365	Durbin-Watson stat	2.048026
Prob(F-statistic)	0.000000		

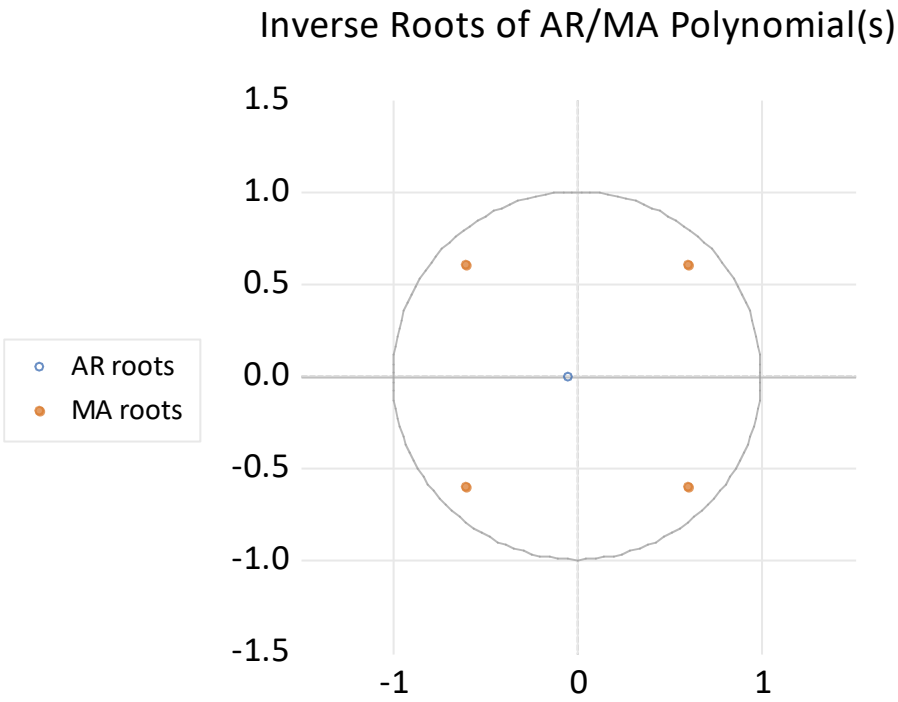
Inverted AR Roots	.99			
Inverted MA Roots	.91	.00-.91i	.00+.91i	-.91

Appendix 5: Ljung-Box Q statistic/ test

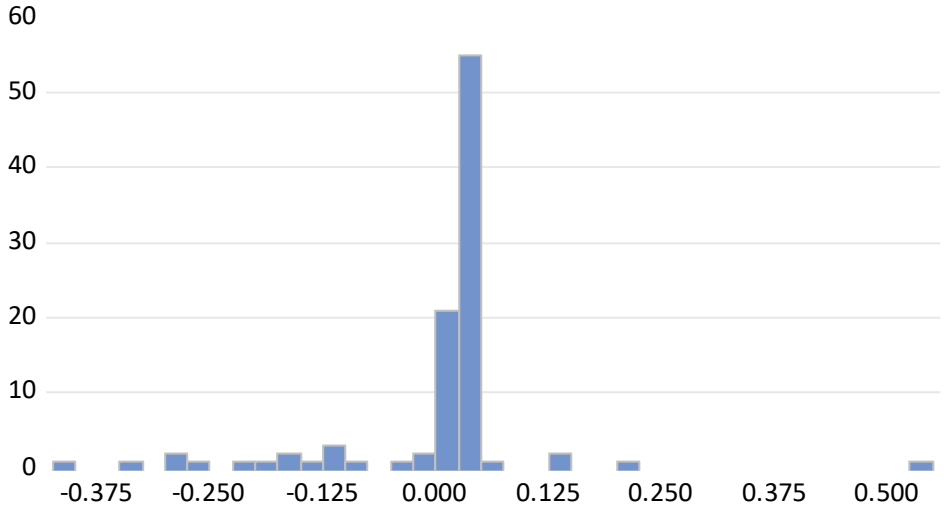
Date: 12/31/25 Time: 17:20
Sample: 2000Q1 2024Q4
Included observations: 95
Q-statistic probabilities adjusted for 2 ARMA terms

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.024	-0.024	0.0568	
		2	-0.024	-0.025	0.1153	
		3	-0.025	-0.026	0.1755	0.675
		4	0.009	0.007	0.1837	0.912
		5	-0.028	-0.028	0.2616	0.967
		6	-0.028	-0.030	0.3426	0.987
		7	-0.028	-0.031	0.4266	0.995
		8	-0.084	-0.089	1.1671	0.978
		9	-0.031	-0.039	1.2708	0.989
		10	-0.032	-0.041	1.3788	0.995
		11	-0.032	-0.043	1.4912	0.997
		12	0.053	0.045	1.8012	0.998
		13	-0.028	-0.037	1.8921	0.999
		14	-0.029	-0.039	1.9872	0.999
		15	-0.029	-0.041	2.0866	1.000
		16	-0.130	-0.156	4.0707	0.995
		17	-0.028	-0.054	4.1644	0.997
		18	-0.029	-0.058	4.2627	0.998
		19	-0.029	-0.062	4.3656	0.999
		20	0.126	0.119	6.3209	0.995
		21	-0.021	-0.041	6.3756	0.997
		22	-0.022	-0.043	6.4341	0.998
		23	-0.022	-0.046	6.4966	0.999
		24	0.178	0.126	10.615	0.980
		25	-0.020	-0.033	10.667	0.986
		26	-0.020	-0.035	10.722	0.991
		27	-0.021	-0.037	10.781	0.994
		28	0.076	0.094	11.577	0.993
		29	-0.022	-0.027	11.646	0.996
		30	-0.023	-0.028	11.721	0.997
		31	-0.023	-0.029	11.800	0.998
		32	0.051	0.027	12.176	0.998
		33	-0.023	-0.027	12.253	0.999
		34	-0.023	-0.028	12.335	0.999
		35	-0.024	-0.028	12.421	1.000
		36	0.091	0.115	13.712	0.999

Appendix 6: ARIMA(1,1,4) structure

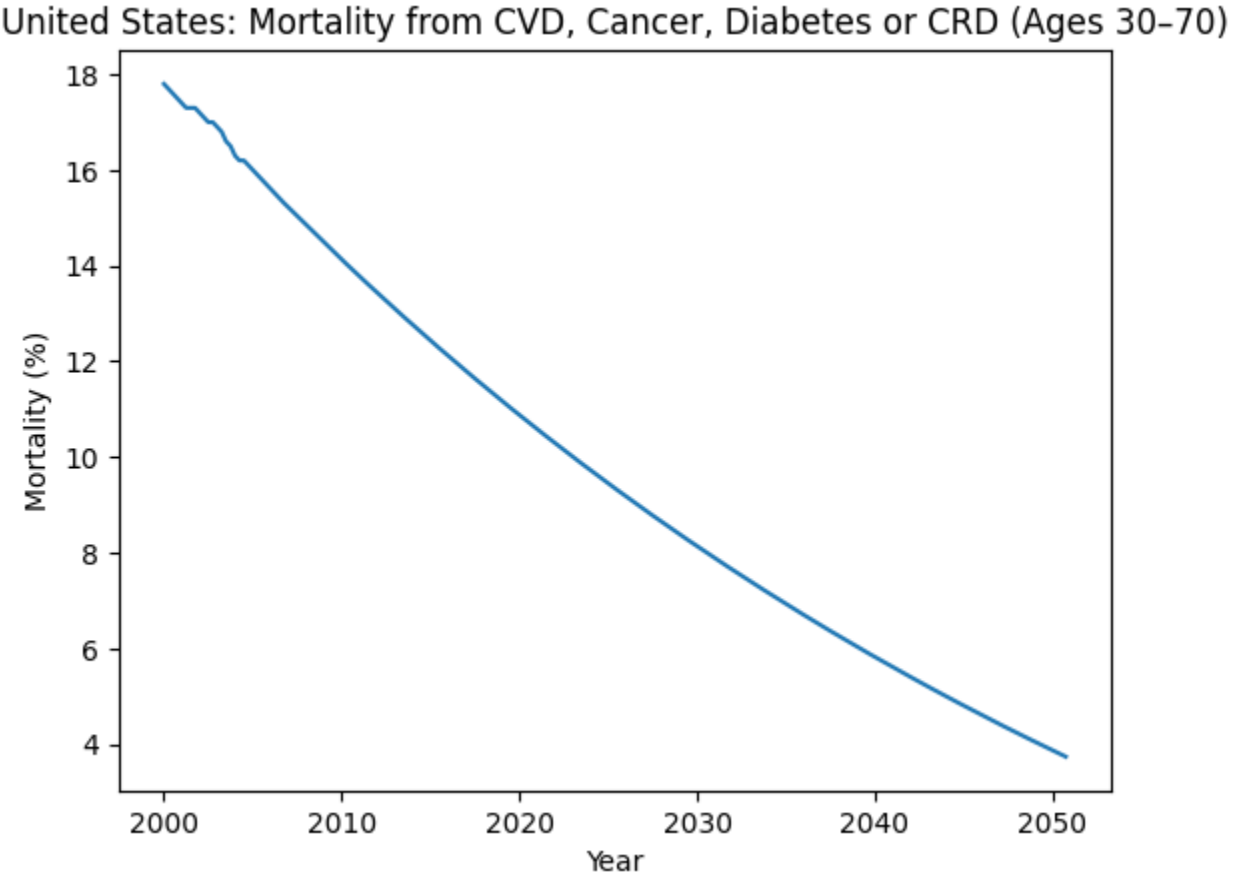


Appendix 7: Histogram of residuals



Series: Residuals	
Sample 2000Q3 2024Q4	
Observations 98	
Mean	0.000549
Median	0.026029
Maximum	0.547021
Minimum	-0.424271
Std. Dev.	0.107902
Skewness	-0.216881
Kurtosis	12.26389
Jarque-Bera	351.1985
Probability	0.000000

Appendix 8: Graph showing the United States' Mortality from CVD, cancer, diabetes or CRD between exact ages 30 and 70 (%), ARIMA(1,1,4) Model Simulation



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Foreign Exchange Rate and GDP Growth Vis-À-Vis Trade Balance in Sub-Saharan Africa

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Abstract: We investigate the interaction effect of foreign exchange rate and economic growth on the trade balance in Sub-Saharan Africa (SSA). We utilize balanced annual panel data for 20 SSA countries covering the period 2005 to 2024. We source the data from the World Development Indicators. We employ the Generalized Method of Moments (GMM) estimator to address endogeneity, dynamic effects, and unobserved country-specific heterogeneity. Empirical results reveal a negative and statistically significant interaction between foreign exchange rate and GDP growth. Specifically, the estimated coefficient of the interaction term (FER*GDP) of -0.190271 implies that a simultaneous 10 percent increase in exchange rate and GDP growth is associated with a deterioration of the trade balance by approximately 1.9 percent. These findings indicate that economic growth occurring alongside exchange rate depreciation is linked to weaker trade balance outcomes, consistent with import-intensive growth structures and limited export supply responsiveness in SSA economies. These results highlight the importance of accounting for structural characteristics when assessing trade balance effects of exchange rate movements and growth dynamics.

Keywords: *GMM, Foreign exchange rate, Gross domestic product, Trade Balance, SSA*

1. Introduction

The relationship between foreign exchange rate movements, economic growth, and external trade performance has long occupied a central place in international macroeconomics and development economics. Exchange rate dynamics influence trade competitiveness by affecting the relative prices of exports and imports, while economic growth shapes trade outcomes through demand expansion, structural transformation, and productive capacity (Krugman et al., 2018). In theory, currency depreciation is expected to improve the trade balance by stimulating exports and discouraging imports, particularly when the Marshall–Lerner condition holds (Marshall, 1923; Lerner, 1944). However, empirical evidence from developing regions, especially Sub-Saharan Africa (SSA), has remained mixed and often contradictory.

Since the mid-1970s, most SSA economies have experienced persistent trade balance deterioration, characterized by chronic current account deficits, rising import dependence, and weak export diversification (UNCTAD, 2019; World Bank, 2023). Despite multiple exchange rate regime reforms including devaluations under structural adjustment programs and the adoption of flexible exchange rate systems, improvements in trade balances have remained limited and short-lived (Edwards, 1989; Rodrik, 2008). At the same time, periods of positive GDP growth in SSA have frequently coincided with widening trade deficits, suggesting that growth has been largely import-intensive and weakly linked to export expansion (Adeniyi et al., 2011).

Existing empirical studies have largely examined the effects of exchange rate movements and economic growth on trade balance independently, often overlooking the possibility that their interaction may be critical in shaping trade outcomes (Bahmani-Oskooee & Ratha, 2004; Wilson, 2001). This omission is particularly consequential for SSA, where structural rigidities, limited manufacturing capacity, and low export supply elasticity may cause economic growth and exchange rate depreciation to jointly exacerbate trade imbalances rather than correct them. Moreover, much of the available evidence is country-specific or based on static models that fail to adequately address endogeneity, dynamic adjustment, and cross-country heterogeneity.

We address this critical gap by explicitly examining the interaction effect of foreign exchange rate movements and GDP growth on the trade balance in SSA. By employing a dynamic panel Generalized Method of Moments (GMM) framework and utilizing balanced panel data for 20 SSA countries over the period 2005 to 2024, we provide robust empirical insights into how growth and exchange rate dynamics jointly influence external trade performance. Understanding this interaction is essential for clarifying why sustained economic growth in SSA

has not translated into improved trade balances and for enriching the broader literature on growth–trade–exchange rate linkages in developing economies.

2. Literature Review

The relationship between foreign exchange rate movements and trade balance has been extensively examined in international economics, with early studies grounded in the Marshall–Lerner condition, which posits that currency depreciation improves trade balance if the sum of export and import demand elasticities exceeds unity (Marshall, 1923; Lerner, 1944). Subsequent empirical work introduced dynamic considerations, notably the J-curve hypothesis, suggesting that trade balance may initially deteriorate following depreciation before improving in the long run (Magee, 1973; Bahmani-Oskooee & Ratha, 2004).

Empirical findings from developed and emerging economies remain mixed. Studies focusing on advanced economies often find support for long-run trade balance improvement following depreciation (Rose & Yellen, 1989; Bahmani-Oskooee & Brooks, 1999). However, evidence from developing economies frequently reports weak or insignificant effects, attributed to low export diversification, rigid production structures, and high import dependence (Goldstein & Khan, 1985; Chinn, 2005).

Beyond exchange rates, economic growth has been shown to exert ambiguous effects on the trade balance. While growth can enhance export capacity through productivity gains, it may simultaneously increase import demand for capital goods and intermediate inputs, leading to trade balance deterioration (Thirlwall, 1979; Krugman et al., 2018). Importantly, most global studies examine exchange rate and growth effects independently, implicitly assuming separability between the two variables. This assumption overlooks potential interaction effects whereby the impact of exchange rate movements on trade balance may depend on the pace and structure of economic growth, a limitation increasingly acknowledged in recent macroeconomic literature (Rodrik, 2008; Aizenman et al., 2012).

Empirical studies focusing on developing regions, particularly SSA, reveal persistent trade balance challenges despite extensive exchange rate reforms since the mid-1970s. Structural adjustment programs across SSA emphasized currency devaluation as a mechanism for correcting external imbalances, yet outcomes have been largely disappointing (Edwards, 1989; UNCTAD, 2019). Several studies find that exchange rate depreciation either worsens trade balance or produces statistically insignificant effects in African economies (Bleaney & Greenaway, 2001; Ng et al., 2008).

Regional analyses attribute these outcomes to weak export supply responsiveness, limited industrialization, and dependence on primary commodity exports with inelastic global demand (Fosu, 2013; World Bank, 2023). Moreover, economic growth episodes in SSA, particularly during commodity booms, have often coincided with widening trade deficits, reinforcing concerns about import-intensive growth patterns (Adeniyi et al., 2011; UNDP, 2020).

Only a limited number of studies have examined the joint role of exchange rate and economic growth in determining trade balance outcomes in SSA. Where interaction effects are implicitly considered, findings suggest that growth amplifies import demand faster than export expansion, thereby offsetting potential gains from currency depreciation (Ohiomu, 2020). However, most regional studies rely on static panel models or country-specific time-series analyses, limiting their ability to address endogeneity, dynamic adjustment and cross-country heterogeneity, key methodological gaps that this study seeks to address.

Country-level studies within SSA further illustrate the complexity of the exchange rate–growth–trade balance nexus. Evidence from Nigeria, Ghana, Kenya, and Uganda suggests that exchange rate depreciation has had limited success in improving trade balances, particularly in the presence of rapid GDP growth driven by imports of consumer goods, fuel, and capital equipment (Alege & Osabuohien, 2013; Kinyua, 2016). These studies consistently highlight structural constraints such as low manufacturing capacity, weak value addition, and narrow export bases.

However, local studies are often constrained by short time spans, small samples, and methodological limitations, including failure to control for simultaneity between growth, exchange rates, and trade outcomes. Crucially, very few explicitly model the interaction between exchange rate movements and economic growth, leaving unresolved questions about whether growth conditions mediate the effectiveness of exchange rate adjustments in SSA economies.

Our study is anchored in three complementary theoretical perspectives. Firstly, the Marshall–Lerner condition provides the foundational framework linking exchange rate depreciation to trade balance adjustment through price elasticities of exports and imports (Marshall, 1923; Lerner, 1944). Secondly, the J-curve theory introduces short-run versus long-run dynamics, emphasizing adjustment lags in trade volumes following exchange rate changes (Bahmani-Oskooee & Ratha, 2004). Thirdly, the absorption approach to the balance of trade posits that trade balance outcomes depend on the relationship between national income and domestic absorption, implying that economic growth may worsen the trade balance if absorption rises faster than output (Alexander, 1952; Thirlwall, 1979).

Together, these frameworks suggest that the effect of exchange rate movements on trade balance is conditional on growth dynamics and structural characteristics of the economy. This theoretical insight motivates the use of an interaction term between foreign exchange rate and GDP growth in the empirical model.

Conceptually, our study posits that trade balance in SSA is influenced by foreign exchange rate movements and economic growth interactively. Exchange rate depreciation affects trade balance through relative price effects, while GDP growth influences trade through changes in import demand and export capacity. The interaction between exchange rate and GDP growth captures the extent to which growth conditions amplify or dampen trade balance response to exchange rate movements. Structural factors such as export diversification, productive capacity, and trade openness serve as underlying channels through which these relationships operate, though they are not explicitly modeled in the interaction term.

3. Data and Method

We adopt a quantitative, explanatory research design based on dynamic panel data econometric analysis. This design is appropriate for examining macroeconomic relationships that evolve and vary across countries, while accounting for persistence, simultaneity, and unobserved heterogeneity (Baltagi, 2021). A dynamic specification is particularly relevant for trade balance analysis, as external sector outcomes tend to exhibit adjustment inertia and path dependence (Bahmani-Oskooee & Ratha, 2004).

We utilize balanced annual panel data for 20 SSA countries (Appendix 11) covering the period 2005 to 2024. Country selection follows a purposive sampling approach, dictated by data availability and completeness across all variables for the full study period. Such non-random sampling is standard practice in macro-panel studies, where coverage is constrained by reliable longitudinal data rather than probabilistic considerations (Hsiao, 2014).

All variables are sourced from the World Development Indicators (WDI) database, which provides harmonized and internationally comparable macroeconomic data widely used in empirical development and international economics research (World Bank, 2023). The dependent variable is trade balance (TB), measured as exports minus imports in absolute terms (TB = |X - M|), reflects the difference between a country's exports (X) and imports (M) and is a key indicator of a nation's economic health and external sector performance (Krugman et al., 2018); Salvatore, 2016). The core explanatory variable is the interaction term between the foreign exchange rate and GDP growth (FER*GDP), designed to capture the conditional and non-linear effects of exchange-rate movements on trade balance outcomes as mediated by growth dynamics, macroeconomic structure, and external adjustment capacity in Sub-Saharan Africa (Goldstein & Khan, 1985; Rodrik, 2008).

To examine the interaction between foreign exchange rate movements and economic growth, the study specifies the following dynamic panel model:

$$TB_{it-1} = \alpha_0 + \alpha_1 TB_{it-1} + \beta_1 FER_{it} * GDP_{it} + \varepsilon_{it} \quad \ldots\ldots(1)$$

Where:
TB_{it} : Trade balance in country *i* at time *t*
TB_{it-1} : Lagged dependent variable capturing trade balance persistence
FER_{it} : Foreign exchange rate in country *i* at time *t*
GDP_{it} : Gross domestic product (GDP) growth in country *i* at time *t*
ε_{it} : Error term.

The interaction term captures the conditional effect of exchange rate movements on trade balance under different growth regimes, consistent with insights from the absorption approach and structuralist trade theories (Alexander, 1952; Thirlwall, 1979). The lagged dependent variable reflects the dynamic adjustment process commonly observed in trade flows (Magee, 1973).

TB and FER are first transformed using natural logarithms to enhance econometric reliability and interpretability. GDP growth, measured in percentage terms and therefore not log-transformed. Logarithmic transformation compresses large numerical scales and reduces the influence of extreme values, which are common in cross-country macroeconomic data. For instance, while the absolute distance between 10 and 10^{10} is enormous, their logarithmic values differ modestly (from 1 to 10), making relationships more stable and comparable. This transformation also helps linearize potentially nonlinear relationships, mitigate heteroskedasticity, and allows estimated coefficients to be interpreted as elasticities, which is particularly useful for policy analysis in international trade and investment studies (Wooldridge, 2010; Baltagi, 2021).

We employ the GMM estimator, specifically the Arellano–Bond (1991) difference GMM approach, to estimate the dynamic panel model. This technique is well-suited for addressing endogeneity arising from reverse causality and simultaneity between trade balance, exchange rate movements, and economic growth (Arellano & Bond, 1991; Roodman, 2009). By using internal instruments derived from lagged values of the endogenous variables, GMM produces consistent and efficient estimates in the presence of unobserved country-specific effects and potential measurement errors (Blundell & Bond, 1998).

Empirical analysis proceeds in several stages. First, descriptive statistics are computed to summarize variable distributions and cross-country variation. Second, the dynamic panel GMM model is estimated to identify both direct and interaction effects of the foreign exchange rate and economic growth on trade balance. Robust standard errors are employed to correct for heteroskedasticity and autocorrelation, in line with best practices in macro-panel analysis (Wooldridge, 2010).

The baseline dynamic specification includes a lagged dependent variable to capture persistence in trade balance performance, alongside the interaction effect of FDI and ECI. The interaction term (FDI*ECI) tests the hypothesis that the impact of FDI on trade balance is conditional on the level of export sophistication, reflecting the complementarity between foreign investment and productive export structures.

To address endogeneity, lagged values of the endogenous regressor (FER*GDP) are used as the instrument. The instrument is valid under the assumption that lagged levels of the endogenous variable are uncorrelated with the contemporaneous error term (Arellano & Bover, 1995). Furthermore, the instrument satisfies the orthogonality condition required by GMM, ensuring identification of structural parameters (Bowsher, 2002). Validity is tested using the Hansen J-statistic, which assesses over-identifying restrictions.

Estimation is conducted using a two-step system GMM with robust standard errors to correct for heteroskedasticity and autocorrelation. Instrument validity is assessed using the Hansen test of over-identifying restrictions. Arellano–Bond serial correlation tests are also employed to confirm model consistency. The number of instruments is carefully controlled to avoid instrument proliferation, in line with best econometric practice (Roodman, 2009).

GMM estimator is expressed as:

$$\hat{\theta}_{GMM} = \underset{\theta}{\operatorname{argmin}}\left[\frac{1}{n}\sum_{i=1}^{n} g(X_i,\theta)\right]' W_n \left[\frac{1}{n}\sum_{i=1}^{n} g(X_i,\theta)\right] \quad \ldots\ldots (2)$$

Where:

$g(X_i,\theta) = \frac{1}{n}\sum_{i=1}^{n} Z_i' \, \varepsilon_i(\theta)$ is the vector of moment conditions,
W_n : A consistent estimate of the weighting matrix,
θ: Vector of structural parameters (Arellano & Bond 1991; Blundell & Bond 1998).

The GMM framework is preferred due to its capacity in handling potential bias from endogenous regressors while accounting for heteroskedasticity and autocorrelation of unknown form (Baltagi, 2021).

4. Results and Discussion

Appendix 1 presents descriptive statistics for the key explanatory variables. Foreign exchange rate, expressed in natural logarithms (LNFER), has a mean value of 4.96, indicating moderate exchange rate levels across SSA economies over the study period. The relatively large standard deviation (2.03) reflects substantial cross-country and temporal variation in exchange rate movements, consistent with the prevalence of currency volatility in the region. The negative skewness (-0.26) suggests a longer left tail, while the kurtosis value of 1.78 indicates a platykurtic distribution, implying fewer extreme observations relative to a normal distribution.

GDP growth, measured in percentage terms and therefore not log-transformed, exhibits a mean of 5.12 percent, underscoring the generally positive growth performance of SSA during the study period. However, the high standard deviation (3.13), pronounced positive skewness (1.67), and excess kurtosis (8.78) indicate significant volatility and the presence of extreme growth episodes, often associated with commodity booms or macroeconomic shocks. The Jarque–Bera statistics strongly reject the null hypothesis of normality for both variables, a common feature of macroeconomic panel data for developing economies.

Stationarity properties of trade balance (LNTB), foreign exchange rate (LNFER), and gross domestic product (GDP) growth were examined using the Augmented Dickey–Fuller (ADF) unit root test (Appendices 2–6). Results indicate that LNTB and LNFER are non-stationary in levels, as the null hypothesis of a unit root cannot be rejected at conventional significance levels ($p > 0.05$). In contrast, GDP growth is stationary in level and therefore does not require differencing. Upon first differencing, the null hypothesis of a unit root is rejected for both LNTB and LNFER ($p < 0.05$), indicating that they become stationary. Accordingly, trade balance and foreign exchange rate are integrated of order one, I(1), while GDP growth is integrated of order zero, I(0). The presence of variables integrated of different orders further supports the use of a dynamic panel GMM estimator, which is particularly appropriate for accommodating mixed orders of integration, addressing endogeneity, and capturing dynamic adjustments in macroeconomic panel data (Dickey & Fuller, 1979; Arellano & Bond, 1991; Baltagi, 2021).

Generalized Method of Moments (GMM) model results (Appendix 7)

$\widehat{\text{LNTB}} = 0.129922 LNTB_{it-1}$ - 0.190271LNFER*GDP …….. (3)

Hence,

$$\hat{\theta}_{GMM} = \begin{bmatrix} 0.129922 \\ -0.190271 \end{bmatrix}$$

The dynamic specification of the trade balance model reveals that the lagged dependent variable, $LNTB_{it-1}$, is positive and statistically significant, with an estimated coefficient of 0.129922. This result indicates partial persistence in trade balance dynamics, suggesting that past trade balance outcomes exert a meaningful influence on current performance. Such persistence reflects adjustment costs, contractual rigidities, and slow structural responses in SSA external sectors, consistent with findings in the empirical trade literature (Bahmani-Oskooee & Ratha, 2004; Edwards, 1989).

Our core finding is the negative and statistically significant interaction effect between foreign exchange rate and GDP growth. The estimated coefficient of the interaction term (FER*GDP) of -0.190271 implies that a simultaneous 10 percent increase in exchange rate and economic growth is associated with approximately a 1.9 percent deterioration in the trade balance. This result suggests that economic growth in SSA, when accompanied by currency depreciation, tends to intensify import demand more rapidly than export expansion.

As a result, the potential competitiveness gains from depreciation are offset by growth-induced import surges, leading to worsening trade balance outcomes.

The interaction result represents a unique contribution to the literature by explicitly demonstrating that trade balance effects of exchange rate movements in SSA are conditional on growth dynamics. While traditional theory predicts that depreciation should improve trade balance under the Marshall–Lerner condition, the present findings align more closely with the absorption approach, which emphasizes the role of income-driven import demand (Alexander, 1952; Thirlwall, 1979).

Our results corroborate earlier regional studies that report weak or adverse trade balance responses to exchange rate depreciation in SSA (Bleaney & Greenaway, 2001; Ng et al., 2008), but extend the literature by showing that GDP growth amplifies these adverse effects. Unlike most previous studies that examine exchange rate and growth effects independently, our study demonstrates that their interaction is a critical transmission channel through which trade imbalances persist in the region. This finding also supports Rodrik's (2008) argument that growth in developing economies may be associated with external imbalances when productive structures remain import-dependent.

Robustness checks indicate that the residuals deviate from normality, as evidenced by a kurtosis value of 4.71 and a Jarque–Bera probability of 0.00 (Appendix 8), leading to rejection of the null hypothesis of normality. Residual plots further reveal that some observations fall outside the confidence bands (Appendix 9), suggesting leptokurtic behavior. Such non-normality is typical in macro-panel data for developing economies, where structural breaks, external shocks, and cross-country heterogeneity are prevalent (Baltagi, 2021). Importantly, this does not invalidate the GMM estimates, as the estimator does not rely on the assumption of normally distributed errors but instead on moment conditions and orthogonality assumptions (Arellano & Bond, 1991; Roodman, 2009).

Hansen J-statistic yields a probability value of 0.449, indicating failure to reject the null hypothesis of instrument validity. This confirms that the instruments employed are exogenous and appropriately specified, alleviating concerns of over-identification or instrument proliferation bias (Roodman, 2009). Further diagnostic testing using the Arellano–Bond serial correlation test reveals statistically significant first-order autocorrelation (AR(1): $m = -3.04$, $p < 0.05$), which is expected in first-differenced dynamic panel models and does not indicate misspecification. In contrast, second-order autocorrelation is absent (AR(2): $m = -1.36$, $p = 0.1747$), confirming the validity of the moment conditions and the consistency of the GMM estimator (Arellano & Bond, 1991).

Limitations

Notwithstanding the empirical rigor and robustness of the analytical framework, several limitations of the study warrant acknowledgment. Firstly, regarding research design, the study employs a dynamic panel estimation approach that identifies average effects across countries and over time. While suitable for regional-level inference, this approach may obscure country-specific heterogeneity and asymmetric responses to exchange rate movements and economic growth, which are often pronounced in developing regions such as SSA (Baltagi, 2021; Hsiao, 2014). Consequently, our findings should be interpreted as representative regional tendencies rather than precise country-level dynamics.

Secondly, the sample is limited to 20 SSA countries over the period 2005 to 2024, selected based on the availability of balanced panel data. Although this enhances econometric consistency and reduces estimation bias, it restricts the external validity of the results. Countries excluded due to data gaps, often those experiencing heightened macroeconomic volatility may exhibit different exchange rate–growth–trade balance relationships, thereby introducing potential sample selection bias (Wooldridge, 2010).

Thirdly, our study relies on secondary data from the World Development Indicators, which, despite being widely used and standardized, may be subject to measurement errors, revisions, and cross-country reporting inconsistencies. Such data limitations are common in macroeconomic analyses of developing economies and may affect the precision of estimated coefficients (Deaton, 1997; World Bank, 2023).

Fourthly, with respect to data analytical procedures, the GMM estimator, though appropriate for addressing endogeneity, unobserved heterogeneity and dynamic adjustment, is sensitive to instrument selection and specification. While diagnostic tests confirm instrument validity, the possibility of weak instruments and finite-sample bias cannot be entirely eliminated (Arellano & Bond, 1991; Roodman, 2009). In addition, the linear interaction specification between foreign exchange rate and GDP growth may not fully capture potential nonlinearities or threshold effects documented in the exchange rate and trade literature (Bahmani-Oskooee & Ratha, 2004).

Last but not least, the model does not explicitly incorporate structural and institutional variables such as export diversification, industrial capacity, trade policy regimes, or institutional quality, which may condition the effectiveness of exchange rate movements and growth on trade balance outcomes. The exclusion of these factors reflects data constraints rather than theoretical omission and points to important directions for future research (Rodrik, 2008; UNCTAD, 2019).

5. Conclusion and Recommendations

Our study provides a comprehensive assessment of the relationship between foreign exchange rate dynamics, economic growth, and trade balance performance in SSA by emphasizing the importance of interaction effects and dynamic adjustment processes. By moving beyond conventional single-channel analyses, the study demonstrates that trade balance outcomes in the region are best understood as the product of interdependent macroeconomic forces operating within structurally constrained economies. In this regard, the study contributes to the literature by clarifying why sustained economic growth in SSA has often coincided with persistent external imbalances rather than trade improvement.

Our analysis reinforces long-standing theoretical insights from the absorption approach and structuralist trade theory, which posit that growth-driven increases in domestic absorption can offset potential competitiveness gains from exchange rate movements in economies with limited export diversification and low supply responsiveness (Alexander, 1952; Thirlwall, 1979; Rodrik, 2008). By explicitly incorporating interaction effects, our study advances empirical understanding of how growth conditions mediate trade balance response to exchange rate changes, a dimension that has been largely overlooked in prior regional and country-specific studies (Bahmani-Oskooee & Ratha, 2004; Edwards, 1989).

More broadly, our study underscores the relevance of dynamic macroeconomic analysis for SSA, where structural rigidities, import dependence, and exposure to external shocks continue to shape external sector performance (UNCTAD, 2019; World Bank, 2023). By adopting a dynamic panel framework that accounts for endogeneity and heterogeneity, our study provides a robust analytical foundation for future research on exchange rate–growth–trade interactions in developing economies. In doing so, it enriches the ongoing discourse on external balance sustainability and macroeconomic adjustment in Sub-Saharan Africa.

Recommendations

Our findings suggest that exchange rate management in SSA should be considered within a broader macroeconomic and structural context rather than as an isolated tool for correcting trade imbalances. Given the interaction between foreign exchange rate movements and economic growth, macroeconomic policies should recognize that growth processes characterized by high import dependence may weaken trade balance response to exchange rate depreciation. This reinforces the importance of coordinating exchange rate policy with growth strategies that enhance domestic productive capacity and export responsiveness, consistent with insights from the absorption approach and structuralist trade theory (Alexander, 1952; Thirlwall, 1979; Rodrik, 2008).

In addition, macroeconomic stability remains critical for moderating the adverse interaction between growth and exchange rate movements. Policies that reduce excessive exchange rate volatility can help limit uncertainty faced by exporters and importers, thereby improving external sector performance over time (Edwards, 1989; Aizenman et al., 2012). Overall, our results point to the need for integrated macroeconomic frameworks that align exchange rate dynamics with sustainable growth and external balance objectives.

At the program level, our study highlights the relevance of initiatives aimed at strengthening export supply capacity and reducing structural import dependence. Programs that promote value addition, industrial upgrading, and diversification away from primary commodity exports are particularly important for improving the effectiveness of exchange rate movements in influencing trade outcomes (UNCTAD, 2019; World Bank, 2023). Such programs may enhance the elasticity of exports and mitigate the tendency for growth-induced import surges to dominate trade dynamics.

Furthermore, regional economic integration programs within SSA such as those supporting intra-African trade, may help reduce vulnerability to external shocks and improve trade balance sustainability by expanding regional markets and supporting economies of scale (UNECA, 2020). Strengthening institutional capacity in trade facilitation, customs administration, and infrastructure development can also support more efficient transmission of macroeconomic policies to the external sector.

Our study opens several avenues for future research. Firstly, subsequent studies could explore country-specific or sub-regional analyses to account for heterogeneity in exchange rate regimes, export structures, and growth patterns across Sub-Saharan Africa (Hsiao, 2014; Baltagi, 2021). Secondly, future research may consider nonlinear or threshold models to examine whether the interaction between exchange rate movements and economic growth varies across different growth or volatility regimes, as suggested in the broader exchange rate literature (Bahmani-Oskooee & Ratha, 2004).

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APPENDICES

Appendix 1: Descriptive Statistics

	LNFER	GDP
Mean	4.958466	5.120312
Median	6.100319	4.834623
Maximum	8.317795	21.07901
Minimum	1.061114	0.033794
Std. Dev.	2.030916	3.129834
Skewness	-0.25531	1.665509
Kurtosis	1.7845	8.783068
Jarque-Bera	26.0726	668.0932
Probability	0.000002	0
Sum	1785.048	1843.312
Sum Sq. Dev.	1480.738	3516.715
Observations	360	360

Appendix 2: Unit root test, LNTB (in Level)

Panel unit root test: Summary
Series: LNTB
Date: 12/23/25 Time: 03:14
Sample: 2005 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.36325	0.0004	20	360
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.78989	0.2148	20	360
ADF - Fisher Chi-square	50.4277	0.1249	20	360
PP - Fisher Chi-square	58.0121	0.0326	20	380

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 3: Unit root test, LNTB (in first difference)

Panel unit root test: Summary
Series: D(LNTB)
Date: 12/23/25 Time: 03:13
Sample: 2005 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.17086	0.0000	20	340
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.35184	0.0000	20	340
ADF - Fisher Chi-square	112.028	0.0000	20	340
PP - Fisher Chi-square	146.681	0.0000	20	360

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 4: Unit root test, LNFER (in Level)

Panel unit root test: Summary
Series: LNFER
Date: 12/24/25 Time: 08:28
Sample: 2005 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.56496	0.9412	20	360
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	5.34094	1.0000	20	360
ADF - Fisher Chi-square	14.7314	0.9999	20	360
PP - Fisher Chi-square	8.31841	1.0000	20	380

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 5: Unit root test, LNFER (in first difference)

Panel unit root test: Summary
Series: D(LNFER)
Date: 12/24/25 Time: 08:26
Sample: 2005 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.56359	0.0000	20	340
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.43966	0.0000	20	340
ADF - Fisher Chi-square	113.624	0.0000	20	340
PP - Fisher Chi-square	130.304	0.0000	20	360

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 6: Unit root test, GDP (in Level)

Panel unit root test: Summary
Series: GDP
Date: 12/24/25 Time: 08:32
Sample: 2005 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.14804	0.0000	20	320
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.07505	0.0000	20	320
ADF - Fisher Chi-square	112.484	0.0000	20	320
PP - Fisher Chi-square	155.679	0.0000	20	340

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 7: Generalized Method of Moments (GMM) model results

Dependent Variable: D(LNTB)
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 12/24/25 Time: 08:51
Sample (adjusted): 2008 2022
Periods included: 15
Cross-sections included: 20
Total panel (balanced) observations: 300
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(D(LNTB),-2) D(LNFER)*GDP(-1)
Constant added to instrument list

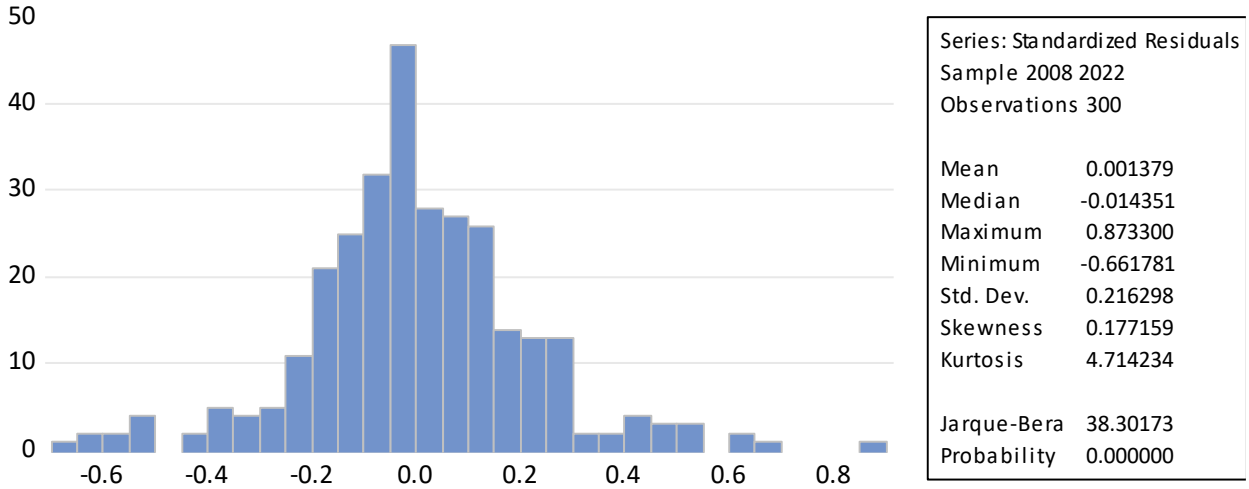
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNTB(-1))	0.129922	0.029468	4.408904	0.0003
D(LNFER)*GDP	-0.190271	0.014357	-13.25247	0.0000

Effects Specification

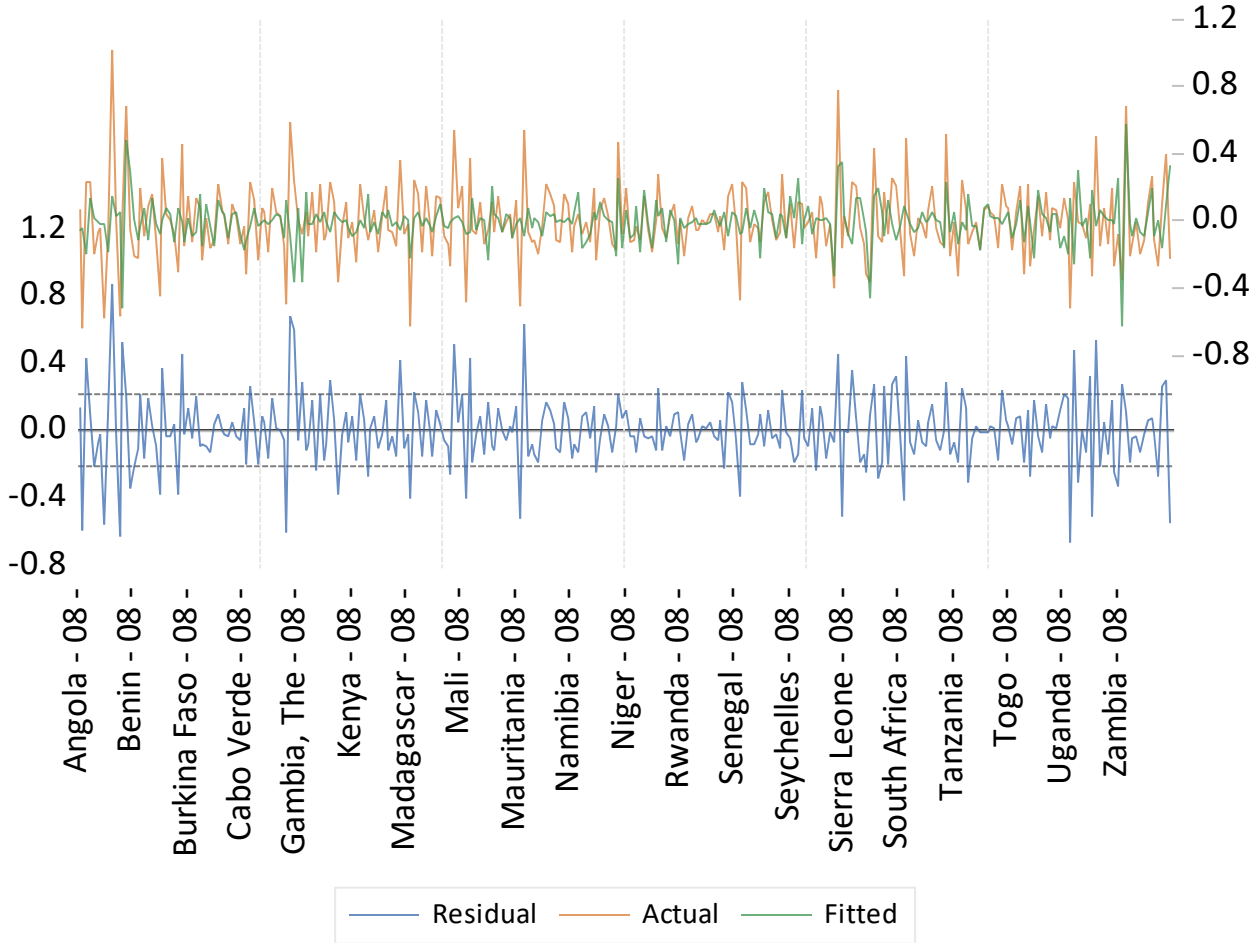
Cross-section fixed (first differences)

Mean dependent var	-0.003795	S.D. dependent var	0.219948
S.E. of regression	0.216665	Sum squared resid	13.98917
J-statistic	18.10059	Instrument rank	20
Prob(J-statistic)	0.449045		

Appendix 8: Normality test



Appendix 9: Graph of residuals



Appendix 10: Serial Correlation Test

Arellano-Bond Serial Correlation Test
Equation: Untitled
Date: 12/24/25 Time: 08:54
Sample: 2005 2024
Included observations: 300

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	-3.044847	-4.928462	1.618624	0.0023
AR(2)	-1.357258	-2.335056	1.720422	0.1747

Appendix 11: List of Sub-Saharan Africa countries in the study

Angola	Gambia, The	Mauritania	Senegal	Tanzania
Benin	Kenya	Namibia	Seychelles	Togo
Burkina Faso	Madagascar	Niger	Sierra Leone	Uganda
Cabo Verde	Mali	Rwanda	South Africa	Zambia

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Managing the Knowledge Supply Chain: Human capital, Structural Capital and Graduate Employability: Testing Interaction Effects

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Abstract: This study examines the interaction effect of human and structural capital on graduate employability in public universities in South-Western Uganda, exploring how their combination enhances labor-market outcomes. The study adopted a positivist research paradigm with a quantitative, cross-sectional design. Data were collected from 377 graduates and 122 academic and administrative staff across Mbarara University of Science and Technology, Kabale University, and Mountains of the Moon University using self-administered questionnaires. Human capital was measured through professional competence, social competence, employee motivation, and leadership, while structural capital comprised institutional systems, infrastructure, and culture. Graduate employability was assessed through job acquisition, employment quality, career adaptability, and entrepreneurial success. Data were analyzed using SPSS and Structural Equation Modeling, with interaction effects tested using Hayes' Process Macro. Human and structural capital both significantly predict graduate employability, accounting for 42.7% of the variance. Inclusion of the interaction term revealed a significant multiplicative effect, indicating that human capital's impact on employability strengthens as structural capital increases. The results confirm that neither capital alone suffices; their synergy optimizes graduate outcomes, consistent with the knowledge supply chain perspective. Universities should jointly invest in faculty expertise and institutional infrastructure, embed employability skills into curricula, and institutionalize industry partnerships. Policymakers should implement performance-based funding, revise quality assurance frameworks to emphasize employability, and promote university-industry collaboration. This study is the first to empirically test the interactive effects of human and structural capital on graduate employability in Ugandan public universities.

Keywords: *Human capital, structural capital, graduate employability, public universities, Uganda*

1. Introduction

Graduate employability represents the final output of a knowledge supply chain in which universities transform inputs—students, faculty expertise, and institutional resources—into employable graduates who meet downstream labor market demand (Habib & Jungthirapanich, 2009; Lan & Shabir, 2024). When this supply chain functions efficiently, graduates possess the competencies employers require; when it breaks down, skills mismatches and graduate unemployment persist. Globally, evidence of supply chain failure abounds: graduates struggle to secure employment despite holding formal qualifications, reflecting persistent gaps between higher education production and labor market requirements (International Labour Organization, 2024).

In Sub-Saharan Africa, nearly half of all graduates face difficulties securing employment annually (Asumadu et al., 2022), a situation driven by weak linkages between universities and employers, limited industrial absorption capacity, and inefficient internal university processes. Uganda mirrors this challenge, with only 12.9% of its 700,000 annual graduates accessing viable formal employment, while an estimated 30.5% remain unemployed (UBOS, 2023; Mastercard Foundation, 2025). These figures signal not merely labor market constraints but fundamental inefficiencies in how Ugandan public universities configure their internal production assets to deliver employable graduates.

Within the knowledge supply chain framework, a university's intellectual capital constitutes its primary production mechanism. Two core assets are particularly critical: human capital, comprising the expertise, skills, and professional competencies of academic and administrative staff (Alfawaire & Atan, 2021); and structural capital, encompassing the institutional systems, curricula, policies, quality assurance mechanisms, and organizational routines that support knowledge application (Bontis, 1998; Kichuk et al., 2021). Human capital serves as the upstream knowledge input—the raw expertise that fuels teaching and

mentorship. Structural capital represents the downstream infrastructure that codifies, transmits, and operationalizes that knowledge into graduate competencies. Graduate employability is the ultimate output measure, signaling whether the knowledge supply chain is functioning effectively.

Prior research confirms that human capital positively influences graduate employability (Clarke, 2018; Donald et al., 2024). However, from a supply chain perspective, no single asset operates in isolation. The effectiveness of upstream inputs depends on the strength of downstream infrastructure. Structural capital provides the enabling systems—curriculum frameworks, internship coordination, quality assurance processes—that translate faculty expertise into tangible graduate outcomes (Hassan et al., 2022). Without robust structural capital, human capital remains tacit, underutilized, and unable to scale its impact across the institution (Beltramino et al., 2020).

Intellectual capital scholarship emphasizes that organizational outcomes emerge from the complementary interaction of human and structural capital rather than from their isolated effects (Kamukama et al., 2010; Huang et al., 2021). When these assets are integrated within a well-managed knowledge supply chain, they create synergies that produce outcomes greater than the sum of their individual contributions—a principle consistent with the Resource-Based View's emphasis on resource complementarity (Barney et al., 2021). Friedrich (1982) argues that when multiple predictors interact, their combined influence may exceed the sum of their main effects, making interaction analysis essential for understanding how supply chain assets jointly determine output quality.

Despite this theoretical foundation, empirical research examining how human and structural capital interact within the knowledge supply chain to influence graduate employability remains limited, particularly in public universities in developing countries (Salinas-Ávila et al., 2020; Ali et al., 2022). Most existing studies adopt additive models that overlook how institutional structures condition the effectiveness of staff expertise. This gap is especially problematic in Uganda, where weak structural capital—underfunding, limited infrastructure, inadequate industry partnerships—may constrain universities' ability to translate available human capital into employable graduate outcomes (Sophia & Onen, 2024). It remains unclear whether investments in faculty development yield maximum returns only when accompanied by strong institutional systems.

Accordingly, this study examines the interaction between human capital and structural capital in shaping graduate employability in Ugandan public universities, using the knowledge supply chain as the organizing conceptual lens. By testing whether structural capital strengthens the effect of human capital on graduate employability, the study advances understanding of how universities can more effectively manage their intellectual capital assets to optimize graduate outcomes. Understanding this nexus is essential for informing higher education reforms, strengthening university-industry linkages, and supporting Uganda's broader development agenda as articulated in Vision 2040 and the National Development Plan IV.

Theoretical Framework

Human Capital Theory

Human Capital Theory, introduced by Schultz (1972) and developed by Becker (1993) emphasizes the role of education and training in enhancing individuals' productivity, competitiveness, and employability. It views human capital as the combination of knowledge, skills, and experiences that increase one's value in the labor market (Tomlinson, 2017; Mgaiwa, 2021). The theory posits that investment in education leads to higher productivity and economic growth, with the labor market rewarding individuals based on their human capital attributes such as qualifications and skills (Nwajiuba et al., 2020). In relation to this study, the theory is relevant because public universities are expected to equip graduates with knowledge and competencies that enhance their employability and readiness for the labor market (Pitan & Muller, 2019). However, the theory has been criticized for assuming that education automatically translates into employment and for overlooking factors such as labor market conditions, creativity, and informal learning opportunities (Tholen, 2020). Despite these limitations, Human Capital Theory provides a foundation for examining how investments in higher education influence graduate employability, particularly in the context of public universities in South-Western Uganda.

Resource-Based View

The Resource-Based View, introduced by Wernerfelt (1984) and refined by Barney (1991) emphasizes that an organization's internal resources are critical sources of competitive advantage. It posits that resources that are valuable, rare, inimitable, and non-substitutable enable sustained competitive advantage (Barney, 2001). Crucially, the theory recognizes that resources rarely create value independently; human and structural capital function as complementary assets whose joint deployment enhances organizational outcomes (Shubita, 2023). In the knowledge supply chain, human capital (staff expertise) serves as the upstream input, while structural capital (institutional systems, curricula, quality assurance mechanisms) provides the infrastructure that codifies and transmits this knowledge to students (Beltramino et al., 2020). The theory is relevant to this study because it establishes the theoretical basis for why human and structural capital must interact to produce employable graduates, with neither asset sufficient alone (Kamukama et al., 2010). However, RBV has been criticized for offering limited insight into how resources are adapted over time to maintain alignment with changing environments (Kero & Bogale, 2023). Despite this limitation, RBV provides the foundation for examining how human and structural capital jointly influence graduate employability in Ugandan public universities.

Dynamic Capabilities View

The Dynamic Capabilities View, articulated by Teece et al. (1997) and subsequently refined (Teece, 2016; 2023) addresses RBV's limitations by explaining how organizations integrate, develop, and reconfigure resources in response to rapidly changing environments. Dynamic capabilities comprise three core activities: sensing (identifying opportunities and threats), seizing (mobilizing resources to respond), and reconfiguring (modifying existing assets to accommodate change) (Teece, 2026). In the knowledge supply chain, human capital underpins sensing by enabling organizations to interpret labor market signals, while structural capital supports seizing by embedding this knowledge into institutional systems and processes (Ahmed et al., 2024; Chavarnakul, 2025). The theory is relevant to this study because it provides the causal mechanism through which human and structural capital interact: universities with strong dynamic capabilities are better able to continuously align staff expertise and institutional systems with evolving employer demands (Siegel & Leih, 2018). Studies confirm that dynamic capabilities strengthen the effect of intellectual capital on performance outcomes (Ali et al., 2021). Thus, the Dynamic Capabilities View offers an overarching framework for understanding how and why human and structural capital interact to enhance graduate employability in public universities in South-Western Uganda.

2. Literature Review

Graduate Employability

Graduate employability refers to the capacity of graduates to secure, maintain, and progress in suitable employment (Behle, 2020). It encompasses both individual attributes and institutional factors that shape labor market outcomes (Clarke, 2018). Within the knowledge supply chain, graduate employability represents the final output measure—the extent to which the university's production process delivers graduates who meet employer specifications (Habib & Jungthirapanich, 2009; Chowdhury et al., 2025). The concept is operationalized as demonstrated labor market success, comprising four observable outcome dimensions: job acquisition, capturing graduates' success in securing initial employment through effective job search processes (Jackson, 2014; Clarke, 2018); employment quality, assessing job-match, compensation adequacy, and long-term career potential (Lindberg, 2007; Roshchin & Rudakov, 2015); career adaptability, reflecting graduates' readiness to cope with career-related tasks, transitions, and changes (Savickas & Porfeli, 2012; Koen et al., 2012); and entrepreneurial success, conceptualizing self-employment and venture creation as a valid pathway for labor market integration (Breznitz & Zhang, 2020; Kozlinska et al., 2023). While extensive research examines graduate employability in Western contexts (Römgens et al., 2020; Donald et al., 2024), limited attention has been paid to developing countries like Uganda, where labor market structures and university resources differ substantially (Igwe et al., 2022; Damoah et al., 2021).

Human Capital and Graduate Employability

Human capital comprises the knowledge, skills, competencies, and attributes embodied in individuals that enhance their productive capacity (Becker, 1993; OECD, 2022). In the knowledge supply chain, human capital constitutes the upstream input—the expertise of academic and administrative staff that fuels teaching,

mentorship, and curriculum development (Romano et al., 2025; Otermans et al., 2025). Within universities, human capital encompasses the explicit and tacit knowledge of academics, researchers, managers, and administrative staff, acquired through formal education, training, and professional experience (Cricelli et al., 2018; de Matos Pedro et al., 2022). Key dimensions include professional competence, social competence, employee motivation, and leadership ability (Sharma, 2021; Ilhamsyah & Purwanto, 2025). Unlike physical assets, human capital is portable—employees retain it beyond their organizational affiliation, making its development and retention strategically critical (Bucăţa & Tileagă, 2023; Serenko et al., 2024).

A substantial body of research confirms that human capital positively influences graduate employability (Clarke, 2018; Römgens et al., 2020; Abelha et al., 2020; Donald et al., 2024). Faculty expertise shapes teaching quality, curriculum relevance, and student skill development, directly affecting graduates' labor market readiness. (Borah & Malik, 2021; Rajaram, 2023). Academics with industry experience impart employer-desired skills, leading to higher graduate employment rates (Hassock & Hill, 2022; Sultanova et al., 2018). Studies in developing countries reinforce these findings. Chigbu and Nekhwevha (2022) found that well-developed academic staff is crucial for enhancing graduates' labor market readiness in South Africa. Cricelli et al. (2018) demonstrated that Colombian universities with high-quality human capital produce graduates with industry-valued skills. However, Okolie et al. (2020) identified constraints in Nigerian universities, including shortages of trained academics, limiting institutions' capacity to equip graduates with relevant competencies. Despite this evidence, scholars caution that human capital alone does not guarantee graduate employment (Clarke, 2018; Abelha et al., 2020). Contextual factors—including institutional systems, curriculum design, and employer engagement—moderate the human capital–employability relationship (Robson, 2023; Tamrat, 2022). This suggests that human capital's effectiveness depends on the supporting institutional environment. Based on this literature, the following hypothesis is proposed: Human capital is positively related to graduate employability in public universities in South-Western Uganda (H_1).

Structural Capital and Graduate Employability

Structural capital comprises the institutionalized knowledge, systems, processes, and infrastructure that support organizational functioning (Bontis, 1998; Astuti et al., 2023). In the knowledge supply chain, structural capital represents the production infrastructure—the enabling environment within which human capital operates to transform inputs into outputs (Sutrisno et al., 2024). In universities, structural capital encompasses curricula, information systems, quality assurance mechanisms, governance frameworks, libraries, databases, patents, organizational culture, and industry partnerships (Salinas-Ávila et al., 2020; de Matos Pedro et al., 2020; Ramírez & Gordillo, 2014). Unlike human capital, structural capital remains with the institution even when individuals leave, providing enduring value (Mukaro et al., 2023). It codifies tacit knowledge into explicit organizational assets, enabling knowledge retention and transfer (Bratianu, 2017; Wang et al., 2021).

Empirical evidence demonstrates that robust structural capital enhances graduate employability. Universities with well-developed systems, supportive learning environments, and industry-aligned curricula produce graduates with better labor market outcomes (Ng et al., 2021; Nwajiuba et al., 2020). Curriculum relevance is critical: programs aligned with industry requirements improve graduate employment prospects (Mgaiwa, 2021). Learning infrastructure, including well-functioning libraries, digital platforms, and online resources, promotes skill development (Nwajiuba et al., 2020; Mintz, 2024). Industry linkages providing internships and work experience enhance employability (Jackson, 2021; Ian et al., 2020). Furthermore, clear pathways between academic programs and occupational fields facilitate labor market entry (Päivi et al., 2023; Stronati, 2023).

International comparisons reveal that countries with strong vocational education systems and structured program–occupation linkages, such as Germany and the Netherlands, create defined pathways for graduates, whereas systems with weaker alignment produce more generalized competition (Araki, 2020; Isopahkala-Bouret & Tholen, 2023). However, the relationship is not deterministic. Wright and Wei (2022) found that elite university attendance does not guarantee employment; supplementary experiences such as internships, networks, and credentials prove more determinative. Kato et al. (2020) demonstrated that skills developed outside traditional university settings can be equally competitive, challenging assumptions about structural capital's primacy. Based on this literature, the following hypothesis is proposed: Structural capital is positively related to graduate employability in public universities in South-Western Uganda (H_2).

Interaction Between Human and Structural Capital

Intellectual capital scholarship emphasizes that organizational outcomes emerge from the synergistic interaction of human and structural capital rather than from their isolated effects (Edvinsson & Malone, 1997; Kamukama et al., 2010; Huang et al., 2021). These components function as complementary assets: human capital generates knowledge and innovation, while structural capital captures, codifies, and scales that knowledge across the organization (Bontis, 1998; Ibarra-Cisneros et al., 2023). In the knowledge supply chain, this interaction represents the value-adding transformation—the point at which upstream inputs of staff expertise combine with production infrastructure of institutional systems to generate outputs of employable graduates (Zheng et al., 2024). The relationship is reciprocal: human capital develops and renews structural capital through research, curriculum innovation, and knowledge creation (Ahmad & Wu, 2022; Wahyudi et al., 2025), while structural capital provides the infrastructure that enables human capital to be mobilized, coordinated, and embedded within organizational processes (Boikanyo, 2025; Kucharska, 2022). Without structural capital, human capital remains tacit and underutilized; without human capital, structural capital lacks the content and insight needed for relevance (Jardon & Martinez-Cobas, 2021; Sutrisno et al., 2024). Their combination creates a unique resource that contributes to innovation capability and organizational performance (Oliveira et al., 2020; Shiyuan et al., 2022).

In higher education contexts, this synergy directly affects graduate employability. Skilled faculty develop innovative curricula and pedagogy, while strong institutional systems ensure these innovations are embedded, scaled, and sustained (Donald et al., 2024; de Matos Pedro et al., 2020). Structural capital ensures that student learning, internships, and industry engagement fully translate faculty expertise into employable competencies. Asiedu et al., 2023). The interaction enables universities to codify tacit knowledge, foster knowledge sharing, and systematically enhance graduate outcomes (Vélez-rolón et al., 2021; Serenko et al., 2024). Empirical evidence supports this interactive effect. Salinas-Ávila et al. (2020) found a symbiotic relationship between human and structural capital in Colombian university research settings. Yazdani et al. (2022) identified positive correlations in entrepreneurial universities. However, findings are not uniform: Kianto et at. (2017) found no discernible correlation in Spanish firms, and Rampa and Agogué (2021) Suggested human capital alone may be negatively associated with radical innovation capability, underscoring the need for interaction analysis. Despite growing recognition of intellectual capital's importance in universities (Bellucci et al., 2021; Strazzullo et al., 2022)Research on how human and structural capital interact to shape graduate employability remains limited, particularly in developing countries (Salinas-Ávila et al., 2020; Ali et al., 2022). Most studies adopt additive models that overlook how institutional structures condition the effectiveness of staff expertise. Friedrich, (1982) argues that when multiple predictors interact, their combined influence may exceed the sum of their main effects, making interaction analysis essential for uncovering underlying relationships. Based on this literature, the following hypothesis is proposed: Human capital influences graduate employability through interaction with structural capital in public universities in South-Western Uganda (H_3).

3. Study design and methodology

The study adopted a positivist paradigm with a quantitative, cross-sectional design to examine the interaction between human capital and structural capital on graduate employability (Cresswell, 2019; Saunders et al., 2019). Data were collected from 377 graduates and 122 academic and administrative staff across three public universities in South-Western Uganda: Mbarara University of Science and Technology, Kabale University, and Mountains of the Moon University. Graduates from the 2019, 2022, and 2023 cohorts were selected using simple random sampling proportionate to each university's graduate population (Yamen, 1973; Lohr, 2022), while staff occupying strategic roles (faculty deans, department heads, quality assurance officers, and human resource directors) were purposively selected using a census approach (Pahwa et al., 2023; Memon et al., 2025).

Self-administered questionnaires, adapted from validated instruments, measured human capital through professional competence, social competence, employee motivation, and leadership ability (Sveiby, 2001; Petty & Guthrie, 2000; Sharma, 2021), structural capital through institutional systems, infrastructure, and culture (Bontis, 2002; Kamukama et al., 2010) and graduate employability through job acquisition, employment quality, career adaptability, and entrepreneurial success (Fugate et al., 2004; Jackson, 2013; Tomlinson, 2017), all on five-point Likert scales (Kusmaryono et al., 2022). Content validity was confirmed through expert review,

with content validity indices exceeding 0.60 for all constructs (Lynn, 1986; Masuwai et al., 2024), while confirmatory factor analysis established convergent validity with composite reliability values between 0.82 and 0.91 and average variance extracted between 0.51 and 0.67, all exceeding recommended thresholds (Hair et al., 2010; Fornell & Larcker, 1981). Discriminant validity was confirmed as the square root of each construct's AVE exceeded its correlations with other constructs (Fornell & Larcker, 1981). Common method bias was mitigated through procedural remedies, including sourcing independent and dependent variables from different respondents and protecting respondent anonymity (Podsakoff et al., 2003; Podsakoff, 2012), with Harman's single-factor test indicating no single factor explained more than 38.5% of variance.

Data were analyzed using SPSS Version 26, with interaction effects tested through hierarchical regression. Aiken and West's (1991) procedures: predictor variables were mean-centered, an interaction term (human capital × structural capital) was created, and a simple slopes analysis was conducted to probe significant interactions (Hayes, 2022). All parametric assumptions, including normality, linearity, homoscedasticity, and multicollinearity, were tested and satisfied.(Tabachnick & Fidell, 2019; Field, 2018), with tolerance values ranging from 0.663 to 0.96 and VIF values from 1.041 to 1.509, all within acceptable limits (Hair et al., 2010). Ethical approval was obtained from the MUST Research Ethics Committee and the National Council of Science and Technology, with informed consent obtained and respondent confidentiality assured throughout.

4. Results

Sample characteristics

The study analyzed data from 377 graduates and 122 academic and administrative staff across three public universities in South-Western Uganda: Mbarara University of Science and Technology (MUST), Kabale University (KAB), and Mountains of the Moon University (MMU), representing response rates of 98.7% and 84.1%, respectively. Among graduates, gender representation was balanced (53.1% male, 46.9% female), with the majority aged 20–29 years (54.1%) and holding bachelor's degrees (70%). Graduates were distributed across cohorts: 2019 (31.8%), 2022 (32.6%), and 2023 (35.5%). At the time of the survey, 51.5% were unemployed, 31.8% formally employed, 9.5% pursuing further studies, and 7.2% self-employed. University staff respondents were predominantly male (54.9%), aged 40 years and above (85.2%), and highly qualified, with 54.1% holding doctoral degrees and 45.9% holding master's degrees. The majority had served nine or more years (54.9%) and occupied middle management positions (58.2%), primarily as department heads (63.1%).

Descriptive Statistics

Table 1 presents descriptive statistics for the study constructs. Mean scores ranged from 3.97 to 4.18 on a five-point scale, indicating moderately high perceptions across all constructs. Standard deviations were low (0.38 to 0.46), suggesting responses clustered closely around the means.

Table 1: Means and Standard Deviations for Constructs

Global variables	Min	Max	Mean	Std. Dev
Human capital	2	4.79	4.071	0.457
Structural capital	1.85	4.23	3.971	0.384
Employability skills	2.08	4.5	4.176	0.455
Graduate employability	2.47	4.43	3.966	0.380

Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) was conducted to validate the measurement models for all constructs before hypothesis testing. Following established guidelines (Hair et al., 2019; Kline, 2023)Items with weak factor loadings were sequentially removed to achieve parsimonious and well-fitting models. The final human capital measurement model retained six items with standardized factor loadings ranging from 0.658 to 0.774 (all $p < .001$). Model fit indices indicated excellent fit: CMIN/DF = 2.728, GFI = 0.987, CFI = 0.988, TLI = 0.974, NFI = 0.981, RMSEA = 0.059. Composite reliability (CR = 0.81) exceeded the 0.70 threshold, and average variance extracted (AVE = 0.63) exceeded 0.50, confirming reliability and convergent validity.

The final structural capital measurement model retained five items with standardized factor loadings from 0.721 to 0.884 (all p < .001). Model fit indices demonstrated excellent fit: CMIN/DF = 1.623, GFI = 0.990, CFI = 0.995, TLI = 0.988, NFI = 0.987, RMSEA = 0.036. CR (0.84) and AVE (0.61) confirmed reliability and validity.
Graduate employability was modeled as a second-order construct comprising three dimensions: job acquisition, employment quality, and entrepreneurial success. Career adaptability was dropped during refinement due to statistical weaknesses. The final model retained eleven indicators with standardized loadings from 0.66 to 0.87 (all p < .001). Model fit was acceptable: CMIN/DF = 2.13, GFI = 0.931, CFI = 0.952, TLI = 0.931, NFI = 0.915, RMSEA = 0.058. CR values ranged from 0.82 to 0.88, and AVE values from 0.61 to 0.65, all exceeding recommended thresholds. Discriminant validity was confirmed as the square root of each construct's AVE exceeded its correlations with other constructs, satisfying the Fornell-Larcker criterion.

Correlation analysis
Table 2 presents zero-order correlations among the study variables. All correlations were positive and statistically significant (p < .01).

Table 2: Zero-order correlation between human and structural capital and graduate employability
Regression analysis

Variables	HC	SC	GE
Human Capital (HC)	**1**		
Structural capital (SC)	**.124****	**1**	
Graduate Employability (GE)	**.551****	**.482****	**1**

Note: ****Correlation is significant at the 0.01 level (one-tailed).**

Human capital demonstrated a significant positive correlation with graduate employability (r = .551, p < .01), providing initial support for Hypothesis 1. Structural capital also correlated positively and significantly with graduate employability (r = .482, p < .01), supporting Hypothesis 2.

Interaction Analysis
To test Hypothesis 3 (H_3)—that human capital influences graduate employability through interaction with structural capital—hierarchical regression analysis was conducted following Aiken and West's (1991) procedures. Predictor variables were mean-centered to reduce multicollinearity, and an interaction term (human capital × structural capital) was created as the product of the centered variables.
Table 3 presents the hierarchical regression results.

Table 3: Regression of graduate employability on human, structural capital and interaction term

	Model 1		Model 2		Model 3	
	B	Sig	B	Sig	B	Sig
Constant	1.972	.000	.835	.000	2.823	.001
Human Capital	.402	.000	.304	.000	-.257	.259
Structural capital			.451	.000	-.151	.537
HC*SC (Interaction effect)					.169	.013
R	.482[a]		.653[b]		.659[c]	
R Square	.233		.427		.434	
Adjusted R-Square	.231		.424		.430	
R Square Change	.233		.194		.007	
F Change	149.417		166.598		6.180	
Sig. F Change	.000		.000		.013	
Sig. (ANOVA)	.000		.000		.000	

Note: ***p<.001, N=499,
HC*SC = *Interaction term*

Source: Primary Data
**Note: HC and SC are mean-centered; coefficients in Model 3 represent conditional effects when the other variable is at its mean (zero). **

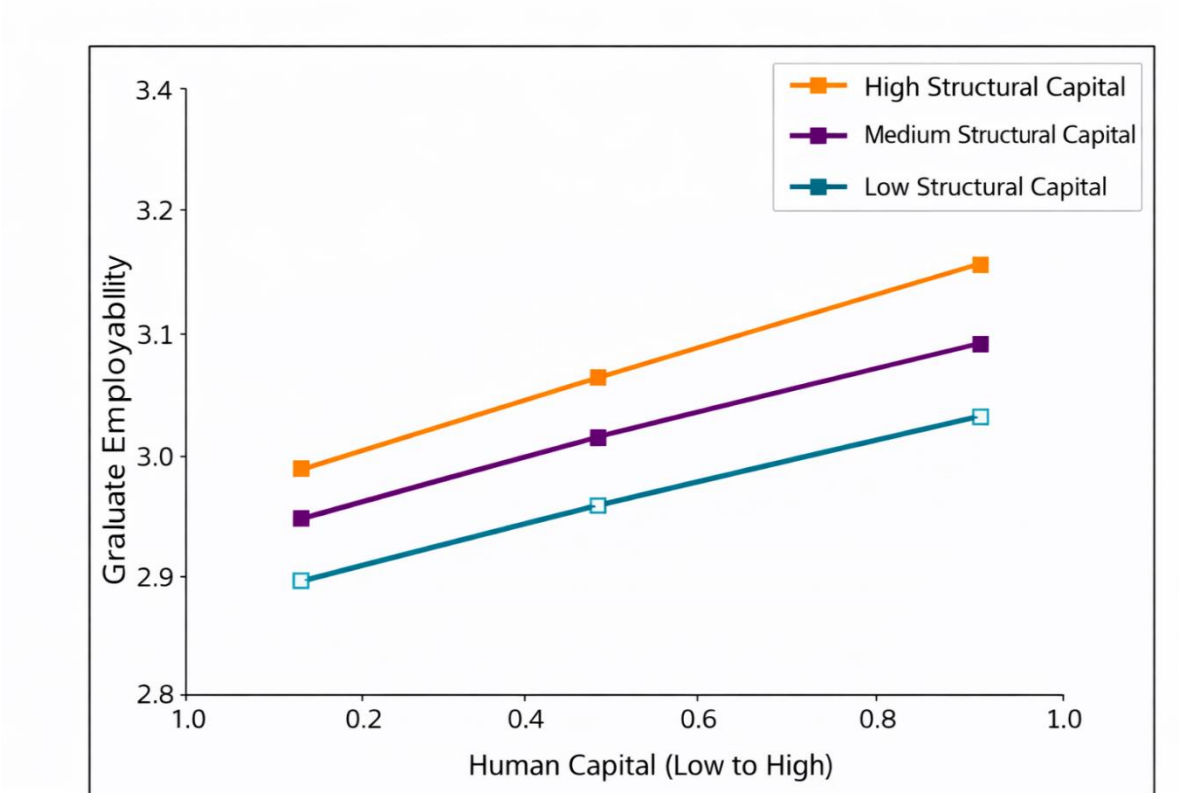
Model 1 regressed graduate employability on human capital alone, showing a significant positive effect (β = 0.402, $p < .001$) and explaining 23.3% of the variance. Model 2 added structural capital, which also had a significant positive effect (β = 0.451, $p < .001$), with both predictors collectively explaining 42.7% of the variance. The significant R^2 change (ΔR^2 = 0.194, $p < .001$) confirmed that structural capital uniquely contributes to graduate employability beyond human capital.

Model 3 introduced the interaction term (human capital × structural capital). The interaction effect was positive and statistically significant (β = 0.169, p = .013), indicating that the effect of human capital on graduate employability depends on the level of structural capital. The inclusion of the interaction term produced a small but significant increase in explained variance (ΔR^2 = 0.007, p = .013).

In Model 3, the main effects of human capital (β = -0.257, p = .259) and structural capital (β = -0.151, p = .537) became non-significant. This is a standard outcome in moderation analysis with mean-centered predictors: these coefficients now represent conditional effects when the other predictor is at its mean value, not average effects across all observations. (Aiken & West, 1991; Hayes, 2022). The non-significance indicates that, for universities with average levels of structural capital, the unique effect of human capital is not distinguishable from zero, illustrating precisely the conditional nature of the relationship.

To interpret the significant interaction, a simple slopes analysis was conducted. Aiken and West (1991). The conditional effect of human capital on graduate employability was calculated at three levels of structural capital: low (one standard deviation below the mean), average (at the mean), and high (one standard deviation above the mean). Figure 1 presents the graphical representation of these simple slopes.

Figure 1: Interaction Effect of Human Capital and Structural Capital on Graduate Employability



Note: Low = one standard deviation below the mean of structural capital; Medium = mean of structural capital; High = one standard deviation above the mean of structural capital.

The simple slopes analysis revealed that the effect of human capital on graduate employability strengthens as structural capital increases. At low levels of structural capital, the relationship between human capital and

graduate employability is relatively weak. At average levels of structural capital, the relationship is moderate. At high levels of structural capital, the relationship is strongest, with the steepest positive slope. The non-parallel lines in Figure 1 confirm the presence of a significant multiplicative interaction. (Aiken & West, 1991; Jose, 2008).

These results support Hypothesis 3 (H_3): human capital significantly influences graduate employability through its interaction with structural capital. The synergistic effect indicates that investments in human capital yield greater returns in terms of graduate employability when supported by robust institutional structures, systems, and resources. Conversely, the impact of human capital is attenuated when structural capital is weak.

Discussion

The positive relationship between human capital and graduate employability ($\beta = 0.460$, $p < .001$) supports Hypothesis 1, confirming that universities with stronger staff professional competence, motivation, and leadership produce graduates with better labor market outcomes. Within the knowledge supply chain, upstream human capital inputs effectively translate into downstream graduate competencies. (Romano et al., 2025). When staff quality is high, the knowledge reservoir available for transmission to students is deeper, directly enhancing the final product's market readiness. This finding aligns with Human Capital Theory. (Becker, 1993) and corroborates evidence that well-developed university staff produce graduates with industry-valued skills (Cricelli et al., 2018; Chigbu & Nekhwevha, 2022). In resource-constrained contexts like Uganda, high-quality human capital functions as a critical adaptive mechanism, compensating for infrastructural deficits (Annala et al., 2023). The finding elevates human capital from a generic input to the primary value-adding node in the knowledge supply chain.

The significant relationship between structural capital and graduate employability ($\beta = 0.258$, $p < .001$) supports Hypothesis 2, indicating that robust institutional systems, infrastructure, and organizational culture enhance graduate outcomes. In the knowledge supply chain, structural capital constitutes the production infrastructure enabling efficient knowledge flow from faculty to students. (Sutrisno et al., 2024). This aligns with evidence that curriculum relevance, learning infrastructure, and quality assurance systems shape graduate employability. (Nwajiuba et al., 2020; Mgaiwa, 2021). From a Resource-Based View perspective (Barney, 1991), structural capital represents a valuable asset that embeds employability into organizational memory, making graduate outcomes less dependent on isolated staff excellence and more resilient to turnover. (Mukaro et al., 2023). This institutionalization transforms individual efforts into a reliable supply chain.

The central contribution of this study is the positive and significant interaction effect between human and structural capital on graduate employability ($\beta = 0.169$, $p = .013$), supporting Hypothesis 3. This interaction indicates that the effect of human capital is conditional upon structural capital: improvements in human capital translate into higher graduate employability when supported by strong institutional systems, but this effect diminishes when structural capital is weak. Simple slopes analysis confirmed that the positive relationship is strongest at high levels of structural capital and weakest at low levels—demonstrating a multiplicative, non-additive effect. (Aiken & West, 1991; Hayes, 2022).

The statistically significant interaction effect ($\beta = 0.169$, $p = .013$) adds 0.7% explained variance beyond the main effects model. While this increment appears modest, in social science research, interaction effects typically explain 1–3% of variance, with even small effects considered meaningful when they demonstrate consistent patterns across conditions. (Aiken & West, 1991; McClelland & Judd, 1993). More importantly, the simple slopes analysis reveals substantively meaningful variation: the effect of human capital shifts from weak at low levels of structural capital to strong at high levels. This conditional pattern has practical implications, suggesting that investments in faculty development yield substantially greater returns when accompanied by parallel investments in institutional infrastructure.

From a knowledge supply chain perspective, this confirms that the integration point between upstream inputs (human capital) and production infrastructure (structural capital) is where value is created. When these nodes operate in isolation, knowledge exists in faculty minds but lacks systems to be codified and transmitted into

student competencies. (Muna et al., 2023). The interaction effect provides evidence that the supply chain functions as an integrated system, not a collection of independent parts.

This finding aligns with intellectual capital scholarship, emphasizing that organizational outcomes emerge from synergistic interaction rather than isolated effects (Edvinsson & Malone, 1997; Kamukama et al., 2010). Human capital develops and renews structural capital through curriculum innovation, while structural capital provides the infrastructure enabling human capital to be mobilized (Wahyudi et al., 2025). Without structural capital, human capital remains tacit and underutilized; without human capital, structural capital lacks the content needed for relevance (Jardon & Martinez-Cobas, 2021). Empirical evidence from Colombian and entrepreneurial universities supports this interactive effect (Salinas-Ávila et al., 2020; Yazdani et al., 2022), and this study extends it to graduate employability in a developing country context.

Theoretically, these results support an integrated Resource-Based View and Dynamic Capabilities perspective. Competitive advantage in producing employable graduates stems not merely from possessing valuable resources but from the dynamic capability to integrate and orchestrate them. (Donald et al., 2024; Teece, 2023). Human capital provides sensing capabilities—interpreting labor market signals—while structural capital supports seizing by embedding this knowledge into institutional systems. (Ahmed et al., 2024). The practical implication is clear: universities investing in staff development in isolation from investments in curricula, digital infrastructure, and career services will yield suboptimal returns. The greatest gains in graduate employability are achieved through integrated initiatives that simultaneously enhance faculty capacity and the institutional platforms channeling that capacity toward student development.

This finding addresses a critical gap. While individual effects of human and structural capital are acknowledged (Mukaro et al., 2023; Sutrisno et al., 2024), empirical evidence on their synergistic interaction in shaping graduate employability has been scarce, particularly in developing country public universities (Salinas-Ávila et al., 2020; Ali et al., 2022). By demonstrating that the effect of human capital is conditional on structural capital, this study moves beyond additive models to explain how these intellectual capital components jointly enhance graduate outcomes. In knowledge supply chain terms, the interaction effect reveals that the whole system outperforms the sum of its parts when integration is achieved.

5. Conclusion and Recommendations

This study concludes that graduate employability in South-Western Ugandan public universities is driven by the synergistic interaction of human and structural capital, with neither alone sufficient to maximize graduate outcomes. Human capital, encompassing faculty and staff competence, motivation, and leadership, and structural capital, comprising institutional systems, infrastructure, and culture, operate multiplicatively rather than independently, confirming the relevance of the knowledge supply chain perspective in tracing how upstream inputs are transformed into labor-market-relevant competencies. Theoretical implications include evidence that these capitals are distinct, multi-dimensional predictors of employability and that contextual adaptation of existing models is necessary for Ugandan universities. The study advances understanding by empirically confirming the synergistic interaction between human and structural capital, moving beyond additive models to explain how intellectual capital components jointly enhance graduate outcomes.

Managerially, universities should strategically invest in faculty expertise and institutional infrastructure, embed employability skills across curricula, and institutionalize career support and industry partnerships to optimize transformation processes. At the policy level, national authorities should implement performance-based funding, revise quality assurance frameworks to evaluate institutional capacity for employability outcomes, and promote university-industry collaboration, including work-integrated learning and graduate tracking systems, to ensure the higher education system responds to labor market needs. Coordinated interventions across universities and policy frameworks will strengthen the knowledge supply chain, ensuring that institutional resources are systematically converted into employable graduates and sustained higher education impact.

Limitations of the study

The findings of this study are subject to limitations that provide directions for future research. Although the constructs were precisely defined through literature and validated by experts, the measurements may not perfectly capture all dimensions of human capital, structural capital, and graduate employability. Notably, the career adaptability dimension of graduate employability was dropped during confirmatory factor analysis due to statistical weaknesses. This suggests that Western-derived employability frameworks may not fully transfer to the Ugandan context, underscoring the need for contextually grounded measures developed specifically for Sub-Saharan African higher education settings. The study employed a single methodological approach; future research could adopt mixed-methods designs to triangulate findings and longitudinal designs to examine dynamic effects over time. Despite these limitations, the results provide valuable insights into the interactive effect of human and structural capital on graduate employability outcomes in Ugandan public universities.

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Government Expenditure and Inflation Vis-À-Vis Trade Balance in Sub-Saharan Africa

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Abstract: We investigate the interaction effect of government expenditure and inflation on the trade balance in Sub-Saharan Africa (SSA). We utilize balanced annual panel data for 20 SSA countries over the period 2005 to 2024 sourced from the World Development Indicators. We apply the Generalized Method of Moments (GMM) estimator to control for endogeneity, unobserved heterogeneity and the dynamic nature of trade balance adjustment. Empirical results indicate a positive and statistically significant interaction between government expenditure and inflation. The estimated coefficient of the interaction term (GEX*INF) is 0.033026, implying that a simultaneous 10 percent increase in government expenditure and inflation improves trade balance by approximately 0.33 percent. This suggests that, in SSA, expansionary fiscal policy combined with moderate inflation can enhance trade balance performance, likely through increased domestic output, improved competitiveness, and reduced import dependence. We recommend coordinated fiscal-monetary policy frameworks that emphasize productive public spending and inflation control to strengthen external sector sustainability.

Keywords: *GMM, Government expenditure, Inflation, Trade Balance, SSA*

1. Introduction

Sub-Saharan Africa (SSA) has historically occupied a central position in global trade, long before the advent of modern capitalism and colonial integration. In ancient times, Africa, particularly North and East Africa, functioned as a major global food and commodity hub. Biblical and historical records indicate that ancient Jewish communities relied on grain imports from Egypt during periods of famine, with Egypt, Sudan, and Ethiopia serving as surplus-producing agrarian economies supplying cereals to the wider Mediterranean and Near Eastern world (Hopkins, 2019; Austin, 2008). These early trade linkages underscore Africa's long-standing productive capacity and integration into global exchange networks.

From the early centuries CE, the Trans-Saharan trade connected West and North Africa, facilitating the exchange of gold, salt, ivory, hides, kola nuts, and textiles, while linking African economies to Europe and the Middle East (Austen, 1987; Lovejoy, 2011). Similarly, the East African long-distance trade anchored along the Swahili Coast connected SSA to Arabia, Persia, India, and China through Indian Ocean trade routes, with exports including spices, ivory, gold, iron tools, and agricultural products (Alpers, 2014). The opening of the Cape routes in the late fifteenth century further integrated SSA into global commerce, intensifying the flow of commodities between Africa, Europe, and Asia (Findlay & O'Rourke, 2007).

However, Africa's trade structure was fundamentally transformed during the Trans-Atlantic trade era, which reoriented production systems toward extractive exports, notably slaves, gold, and raw materials while undermining indigenous manufacturing and agricultural diversification (Rodney, 2002; Acemoglu et al., 2001). Colonial economic systems subsequently entrenched mono-export dependence, import-biased consumption patterns, and weak industrial bases, that is, structural features that continue to shape SSA's trade outcomes today.

In the post-independence period, particularly since the mid-1970s, most SSA economies have experienced a persistent deterioration in trade balance, characterized by rising imports of manufactured goods and capital equipment, volatile export earnings, and chronic current account deficits (UNCTAD, 2019; World Bank, 2024). This deterioration coincided with expansionary fiscal policies, oil price shocks, macroeconomic instability and inflationary pressures, which collectively weakened external competitiveness and import-substitution efforts (Easterly & Levine, 1997; Ndulu et al., 2008).

Despite extensive literature on the determinants of trade balance in developing economies, existing studies largely examine the separate effects of government expenditure and inflation on external sector performance (Edwards, 1989; Frenkel & Razin, 1996; Iyoha, 2000). While government expenditure can stimulate domestic production and export capacity through infrastructure and industrial support, it may also exacerbate import demand if biased toward consumption. Similarly, inflation can either improve trade balance via real exchange rate depreciation or worsen it through cost-push effects and loss of competitiveness (Kamin & Rogers, 2000). However, empirical evidence on the interaction between government expenditure and inflation remains remarkably sparse, particularly in the SSA context.

Our study addresses this critical gap by examining the interaction effect of government expenditure and inflation on trade balance in SSA. Unlike prior studies that treat fiscal and price dynamics independently, this research recognizes that fiscal expansion often operates within inflationary environments in SSA, and that their combined effect may be fundamentally different from their isolated impacts. Understanding this interaction is essential for explaining why large public spending programs have not consistently translated into improved trade outcomes across the region.

The rationale for our study is therefore threefold. Firstly, it responds to the persistent and unresolved problem of SSA's trade balance deterioration since the 1970s. Secondly, it contributes to the literature by providing an integrated fiscal-price framework for analyzing trade balance dynamics. Thirdly, it offers policy-relevant insights for designing coordinated fiscal and monetary strategies capable of restoring Africa's historical role as a competitive and productive participant in global trade.

2. Literature Review

The relationship between government expenditure, inflation, and trade balance is rooted in classical, Keynesian, and structuralist macroeconomic theories. Classical economists, notably Adam Smith, emphasized trade openness, specialization, and fiscal restraint as engines of national wealth. In The Wealth of Nations, Smith (1776) argued that nations prosper by expanding markets, minimizing distortions, and efficiently allocating public resources. While Smith did not explicitly advocate colonization, his emphasis on securing raw materials, expanding markets, and reducing production costs profoundly influenced European mercantilist and later capitalist expansion. These ideas were subsequently invoked often selectively to justify the scramble and partition of Africa, as European powers sought colonies to supply cheap raw materials and absorb manufactured exports, reshaping Africa's trade structure into a primary-commodity-dependent system (Rodney, 2002; Chang, 2002; Acemoglu et al., 2001).

Keynesian theory, by contrast, emphasizes the role of government expenditure in stimulating aggregate demand and productive capacity, particularly during periods of underutilized resources. Expansionary fiscal policy can improve the trade balance if public spending is directed toward infrastructure, industrialization, and export-enhancing sectors (Keynes, 1936; Thirlwall, 1979). However, Keynesian models also recognize that excessive government expenditure may fuel inflation, which can either improve trade balance through real exchange rate depreciation or worsen it by eroding competitiveness, depending on structural conditions.

Monetarist and structuralist theories further refine this nexus. Monetarists argue that inflation primarily reflects excess money supply growth, often exacerbated by fiscal deficits, with adverse implications for external balance (Friedman, 1968). Structuralists, particularly in developing country contexts, emphasize supply rigidities, import dependence, and weak industrial bases, suggesting that inflation and fiscal expansion interact in complex ways that shape trade outcomes (Prebisch, 1950; Frenkel & Taylor, 2006). These perspectives underscore the need to examine government expenditure and inflation jointly, rather than in isolation.

At the global level, empirical studies provide mixed evidence on the effects of government expenditure and inflation on trade balance. Edwards (1989) finds that fiscal expansions in developing economies tend to worsen trade balance when spending is consumption-oriented, but improve it when targeted toward tradable sectors. Similarly, Frenkel & Razin (1996) show that inflation can improve trade balance through real exchange rate adjustments, although persistent inflation undermines export competitiveness in the long run.

Studies employing dynamic panel techniques reveal that the interaction between fiscal policy and inflation is crucial. Bleaney & Greenaway (2001) argue that macroeconomic instability characterized by high inflation and fiscal imbalances significantly weakens trade performance. Afonso & Jalles (2014) demonstrate that productive government expenditure mitigates the negative trade effects of inflation in emerging economies, highlighting the importance of fiscal quality and policy coordination. However, most global studies treat government expenditure and inflation as separate regressors, failing to capture their combined influence on trade balance dynamics, an omission particularly problematic for inflation-prone, fiscally constrained economies.

In developing regions, especially Africa, the literature emphasizes structural vulnerabilities. UNCTAD (2019) and the World Bank (2024) document persistent trade deficits driven by import dependence, commodity price volatility, and limited value addition. Ndulu et al. (2008) argue that post-1970s fiscal expansions in SSA, often financed through deficits and monetary accommodation, contributed to inflationary pressures without commensurate export growth.

Empirical studies specific to SSA yield nuanced findings. Iyoha (2000) finds that government expenditure worsens trade balance in the short run but improves it in the long run when directed toward productive investment. Similarly, Adeniyi et al. (2011) show that macroeconomic policy coordination is critical for improving external sector performance in small open African economies. Kamin & Rogers (2000) note that moderate inflation can enhance trade balance through competitiveness gains, but high inflation reverses these benefits. Despite these insights, empirical evidence on the interaction effect of government expenditure and inflation in SSA remains scarce. Existing studies predominantly focus on exchange rates, export diversification, or terms of trade, leaving a significant gap in understanding how fiscal-price dynamics jointly shape trade balance outcomes.

Country-level studies within SSA further highlight heterogeneity. For example, studies on Nigeria, Ghana, Kenya, and South Africa indicate that expansionary fiscal policy often increases imports due to weak domestic manufacturing capacity (Alege & Ogundipe, 2015; Ssekuma, 2011). Inflationary environments exacerbate this effect by increasing production costs and reducing export competitiveness. However, when government expenditure targets infrastructure and agriculture, some countries experience improvements in trade balance through import substitution and export expansion (Fosu, 2017). These localized findings reinforce the argument that context matters, and that the interaction between government expenditure and inflation is conditioned by structural characteristics common across SSA economies.

The conceptual framework underpinning this study posits that government expenditure and inflation jointly influence trade balance through multiple transmission channels. Government expenditure affects the trade balance directly by stimulating domestic production, infrastructure development, and export capacity, and indirectly by influencing aggregate demand and import consumption. Inflation moderates this relationship by altering relative prices, real exchange rates, and production costs. The interaction between government expenditure and inflation, therefore, determines whether fiscal expansion translates into improved competitiveness or heightened external imbalances.

3. Data and Method

We adopt a quantitative, longitudinal panel research design, appropriate for examining dynamic macroeconomic relationships across countries and over time. The panel framework enables the analysis to exploit both cross-sectional and time-series dimensions of the data, thereby improving estimation efficiency and controlling for unobserved country-specific heterogeneity that may bias results in purely cross-sectional or time-series analyses (Hsiao, 2014; Baltagi, 2021). Given the persistence and potential endogeneity inherent in trade balance dynamics, a dynamic specification is employed, allowing past trade balance outcomes to influence current performance.

We utilize balanced annual panel data for 20 SSA countries (Appendix 12) covering the period 2005 to 2024. Countries are selected based on data availability, consistency, and completeness across all variables of interest, ensuring a balanced panel and minimizing sample selection bias (Wooldridge, 2010). The selected sample

represents diverse SSA sub-regions and income groups, enhancing the generalizability of the findings within the region.

The sampling approach is purposive and criterion-based, justified by the macroeconomic nature of the study and the need for reliable, comparable data across countries and time. This approach is consistent with prior empirical studies on SSA macroeconomic performance that prioritize data quality over sample size (Ndulu et al., 2008; Adeniyi et al., 2011).

Data for all variables are obtained from the World Development Indicators (WDI) of the World Bank, a widely used and credible source for cross-country macroeconomic analysis (World Bank, 2023). The dependent variable is trade balance (TB), measured as exports minus imports in absolute terms (TB = |X - M|), reflects the difference between a country's exports (X) and imports (M) and is a key indicator of a nation's economic health and external sector performance (Krugman et al., 2018; Salvatore, 2016).

The key explanatory variables are government expenditure (GEX), measured as general government final consumption expenditure as a percentage of GDP, and Inflation, consumer prices (annual %) (INF). To capture the joint fiscal-price effect, an interaction term (GEX*INF) is constructed, allowing the study to assess whether the impact of government spending on trade balance is conditional on inflationary pressures.

The core equation for trade balance is specified as:

$$TB_{it} = \alpha_0 + \alpha_1 TB_{it-1} + \beta_1 GEX_{it} * INF_{it} + \varepsilon_{it} \quad \text{.....(1)}$$

Where:
TB_{it} : Trade balance in country *i* at time t
TB_{it-1} : Lagged dependent variable capturing trade balance persistence
GEX_{it} : Government expenditure in country *i* at time t
INF_{it} : Inflation in country *i* at time t
ε_{it} : Error term.

TB and GEX are first transformed using natural logarithms to enhance econometric reliability and interpretability. INF, measured in percentage terms and therefore not log-transformed. Logarithmic transformation compresses large numerical scales and reduces the influence of extreme values, which are common in cross-country macroeconomic data. For instance, while the absolute distance between 10 and 10^{10} is enormous, their logarithmic values differ modestly (from 1 to 10), making relationships more stable and comparable. This transformation also helps linearize potentially nonlinear relationships, mitigate heteroskedasticity, and allows estimated coefficients to be interpreted as elasticities, which is particularly useful for policy analysis in international trade and investment studies (Wooldridge, 2010; Baltagi, 2021).

We employ the Generalized Method of Moments (GMM) estimator developed by Arellano & Bond (1991) difference GMM approach, to estimate the dynamic panel model. GMM is particularly suitable for this analysis for several reasons. Firstly, it effectively addresses endogeneity arising from reverse causality between trade balance and macroeconomic policy variables. Secondly, it controls for unobserved heterogeneity and dynamic panel bias associated with the inclusion of a lagged dependent variable. Thirdly, it is well-suited for panels with small cross-sections and relatively long-time dimensions, a common feature in SSA macroeconomic studies (Roodman, 2009).

Lagged levels of the endogenous variables are used as internal instruments, consistent with standard practice in dynamic panel estimation. The validity of the instruments is assessed using the Hansen test of over-identifying restrictions, while the Arellano–Bond test for serial correlation is employed to ensure the absence of second-order autocorrelation in the differenced residuals.

Data analysis proceeds in several stages. Firstly, descriptive statistics are computed to summarize the distribution and variability of the variables. Secondly, the GMM estimator is applied to estimate the baseline and augmented models. Robust standard errors are reported to account for heteroskedasticity and autocorrelation. Finally, sensitivity analyses are conducted to assess the robustness of the results to alternative specifications and instrument sets.

GMM estimator is expressed as:

$\hat{\theta}_{GMM} = \underset{\theta}{\operatorname{argmin}}[\frac{1}{n}\sum_{i=1}^{n} g(X_i,\theta)]' W_n [\frac{1}{n}\sum_{i=1}^{n} g(X_i,\theta)]$ …….…….. (2)

Where:

$g(X_i,\theta) = \frac{1}{n}\sum_{i=1}^{n} Z_i' \, \varepsilon_i(\theta)$ is the vector of moment conditions,

W_n : A consistent estimate of the weighting matrix,

θ: Vector of structural parameters (Arellano & Bond 1991; Blundell & Bond 1998).

The GMM framework is preferred due to its capacity in handling potential bias from endogenous regressors while accounting for heteroskedasticity and autocorrelation of unknown form (Baltagi, 2021).

4. Results and Discussion

Appendix 1 presents descriptive statistics for the key variables, log of government expenditure (LNGEX) and inflation (INF), based on 400 observations across SSA. The mean value of LNGEX is 21.31, with a relatively low standard deviation of 1.40, indicating moderate dispersion of government expenditure across countries and time. This suggests that public spending levels in SSA are relatively clustered, reflecting comparable fiscal structures and expenditure constraints across the region. Inflation, however, exhibits a mean of 7.35 percent with a substantially higher standard deviation of 7.41, highlighting considerable macroeconomic volatility across SSA economies.

Skewness and kurtosis statistics further reveal important distributional properties. LNGEX displays mild positive skewness (0.53) and near-normal kurtosis (3.63), while inflation is highly right-skewed (2.68) and strongly leptokurtic (13.83), reflecting the presence of extreme inflationary episodes in some countries. The Jarque–Bera statistics confirm rejection of normality for both variables ($p < 0.05$), a common feature of macroeconomic panel data in developing regions characterized by structural breaks, policy regime shifts, and external shocks (Baltagi, 2021; Ndulu et al., 2008).

We examine stationarity of trade balance (LNTB), government expenditure (LNGEX), and inflation (INF) using the Augmented Dickey–Fuller (ADF) unit root test (Appendices 2–7). Results indicate that all variables are non-stationary in levels, as the null hypothesis of a unit root cannot be rejected at conventional significance levels ($p > 0.05$). This confirms the presence of stochastic trends in the series. However, after first differencing, the null hypothesis of a unit root is rejected for each variable ($p < 0.05$), implying that all variables become stationary at first difference, that is, integrated of order one, I(1). These findings justify the adoption of a dynamic panel modeling approach and the use of the GMM, which is well-suited for handling non-stationary macroeconomic variables in panel settings (Arellano & Bover, 1995; Blundell & Bond, 1998).

Generalized Method of Moments (GMM) model results (Appendix 8)

$\widehat{\text{LNTB}} = 0.197344 LNTB_{it-1} + 0.033026\text{LNGEX*INF}$ …..... (3)

Hence,

$$\hat{\theta}_{GMM} = \begin{bmatrix} 0.197344 \\ 0.033026 \end{bmatrix}$$

The estimated trade balance model reveals that the lagged dependent variable, $LNTB_{it-1}$, is positive and statistically significant, with a coefficient of 0.197344. This implies that approximately 19.7 percent of past trade balance performance persists into the current period, confirming the dynamic and path-dependent nature of external sector adjustment in SSA economies. This finding aligns with earlier studies that emphasize trade balance inertia arising from structural rigidities, export concentration, and slow adjustment of production and consumption patterns (Edwards, 1989; Iyoha, 2000).

The core finding of the study is the positive and statistically significant interaction effect between government expenditure and inflation (GEX*INF). The estimated coefficient of 0.033026 indicates that a simultaneous 10 percent increase in government expenditure and inflation improves the trade balance by approximately 0.33 percent, ceteris paribus. This suggests that, within SSA, expansionary fiscal policy operating under moderate

inflationary conditions can enhance trade balance performance. A plausible explanation is that increased government expenditure particularly when directed toward infrastructure, agriculture, and productive sectors stimulates domestic output and import substitution, while moderate inflation improves external competitiveness through real exchange rate adjustments (Frenkel & Razin, 1996; Kamin & Rogers, 2000).

Robustness diagnostics reveal that the residuals deviate from normality, as indicated by a kurtosis value of 4.76 and a Jarque–Bera probability of 0.00 (Appendix 9), leading to rejection of the null hypothesis of normality. Residual plots (Appendix 10) further show that some observations lie outside the confidence bands, suggesting leptokurtic behavior. Such non-normality is typical in macro-panel data for developing economies, where structural breaks, commodity price shocks, and policy discontinuities are prevalent (Baltagi, 2021). Importantly, this deviation from normality does not undermine the validity of the GMM estimates. The GMM estimator does not require normally distributed errors but instead relies on moment conditions and orthogonality assumptions for consistency and efficiency (Arellano & Bond, 1991; Roodman, 2009).

The robustness of the model is further supported by the Hansen J-statistic, whose probability value of 0.427 implies failure to reject the null hypothesis that the instruments are valid. This confirms that the instruments used in the GMM estimation are exogenous and correctly excluded from the estimated equation, indicating the absence of instrument proliferation or over-identification bias (Roodman, 2009).

The Arellano–Bond serial correlation test (Appendix 11) indicates the presence of first-order autocorrelation and the absence of second-order autocorrelation in the differenced residuals. Specifically, the AR(1) statistic is negative and statistically significant ($m = -4.415$, $p < 0.05$), which is expected in first-differenced dynamic panel models and does not signal model misspecification. In contrast, the AR(2) statistic is not significant, confirming that the moment conditions are correctly specified and that the model is dynamically stable (Arellano & Bond, 1991).

Our findings are broadly consistent with previous empirical evidence that highlights the importance of fiscal policy and macroeconomic stability in shaping trade balance outcomes (Edwards, 1989; Iyoha, 2000; Adeniyi et al., 2011). However, the present study advances the literature by explicitly modeling the interaction between government expenditure and inflation, rather than treating them as independent determinants.

Unlike earlier studies that often report adverse trade effects of inflation or fiscal expansion in isolation, this study demonstrates that their combined effect can be trade-enhancing in the SSA context when inflation remains within manageable thresholds. This interaction-based insight constitutes a key novelty of the study and provides a more nuanced explanation for the mixed trade balance outcomes observed across SSA since the mid-1970s.

Limitations

Despite the rigorous design and robust econometric techniques employed, our study is subject to several limitations that should be acknowledged when interpreting the findings.

Firstly, we adopt a quantitative macro-panel research design, which, while appropriate for identifying broad regional patterns, inherently abstracts from country-specific institutional, political, and structural nuances. Sub-Saharan Africa is highly heterogeneous in terms of fiscal capacity, monetary frameworks, and trade structures. Consequently, the estimated coefficients represent average effects and may mask important country-level variations that could influence the government expenditure–inflation–trade balance nexus (Hsiao, 2014; Ndulu et al., 2008).

Secondly, the sample selection is constrained to 20 SSA countries over the period 2005 to 2024, primarily due to data availability and completeness. Although this balanced panel enhances econometric reliability, it necessarily excludes countries with weak statistical systems or incomplete reporting. This introduces a potential sample selection bias, as the excluded countries may exhibit more severe macroeconomic instability or trade imbalances, potentially affecting the external validity of the results (Wooldridge, 2010).

Thirdly, our study relies exclusively on secondary data from the World Development Indicators, which, while widely regarded as credible, are subject to measurement errors, revisions, and reporting inconsistencies particularly for inflation and government expenditure in low-income economies. Such data limitations may introduce attenuation bias and reduce the precision of the estimated coefficients (Deaton, 1997).

Fourthly, the measurement of government expenditure as aggregate government final consumption expenditure does not capture differences in the composition and efficiency of public spending. Productive expenditure on infrastructure, agriculture, or industrial support may affect the trade balance differently from recurrent or consumption-oriented spending. Similarly, inflation is measured using headline consumer price indices, which may not fully reflect producer-level price dynamics or sector-specific inflationary pressures relevant for trade competitiveness (Afonso & Jalles, 2014; Easterly, 2005).

Fifthly, although we employ the GMM estimator to address endogeneity, dynamic persistence, and unobserved heterogeneity, the method itself is not without limitations. GMM estimates can be sensitive to instrument choice, lag structure, and instrument proliferation, which may weaken the Hansen test and bias results in finite samples. While this study mitigates these concerns by limiting the instrument count and conducting standard diagnostic tests, some residual risk of instrument-related bias remains (Roodman, 2009; Baltagi, 2021).

Finally, the analysis does not explicitly account for structural breaks arising from major external shocks such as the global financial crisis, commodity price collapses, or the COVID-19 pandemic. These events may have altered fiscal behavior, inflation dynamics, and trade performance in ways not fully captured by the model. Future research could extend the analysis by incorporating regime-switching models, structural break tests, or country-specific case studies to enrich the understanding of these dynamics.

5. Conclusion and Recommendations

We set out to deepen understanding of the persistent trade balance challenges facing Sub-Saharan Africa by examining how fiscal policy and price dynamics jointly shape external sector performance. Anchored in classical, Keynesian, and structuralist perspectives, and motivated by Africa's long-standing integration into global trade followed by sustained post-independence external imbalances, we offer a comprehensive reassessment of the government expenditure–inflation–trade balance nexus within a dynamic macroeconomic framework.

By adopting a regional panel approach and a dynamic estimation strategy suited to endogeneity-prone macroeconomic relationships, we move beyond fragmented analyses that isolate fiscal or inflationary effects. Instead, we demonstrate the importance of policy interactions in explaining trade outcomes in structurally constrained economies. This interaction-based perspective advances the literature by reconciling previously mixed empirical findings and highlighting the conditional nature of fiscal effectiveness in inflationary environments common across Sub-Saharan Africa.

From a policy standpoint, our study underscores that trade balance sustainability in SSA cannot be achieved through isolated fiscal expansion or inflation control alone. Rather, it requires coordinated macroeconomic management in which public expenditure is strategically aligned with productive capacity, competitiveness, and structural transformation objectives. Such coordination is particularly critical in economies characterized by import dependence, narrow export bases, and vulnerability to external shocks (Ndulu et al., 2008; UNCTAD, 2019).

Beyond its immediate policy relevance, our study contributes methodologically by demonstrating the suitability of dynamic panel techniques for analyzing external sector dynamics in developing regions, while also acknowledging the importance of historical and structural contexts in shaping contemporary trade outcomes. In doing so, we bridge empirical macroeconomics with Africa's political economy of development. Overall, our study reaffirms that restoring Sub-Saharan Africa's trade competitiveness and external balance is less a question of fiscal scale than of fiscal quality and macroeconomic coherence.

Recommendations

Drawing from the empirical insights and overarching conclusions of our study, the following recommendations are proposed to guide policymakers, development practitioners, and researchers toward improving trade balance sustainability in Sub-Saharan Africa (SSA).

Firstly, governments in SSA should pursue coordinated fiscal-monetary policy frameworks that explicitly recognize the interaction between government expenditure and inflation in shaping external sector outcomes. Rather than treating fiscal expansion and inflation control as independent policy domains, macroeconomic authorities should adopt integrated policy stances that align public spending decisions with price stability objectives to enhance trade competitiveness (Frenkel & Razin, 1996; Ndulu et al., 2008).

Secondly, fiscal policy should prioritize productive and trade-enhancing expenditure. Public spending should be strategically directed toward infrastructure, agriculture, agro-processing, manufacturing, and logistics—sectors with strong potential for export expansion and import substitution. Such expenditure improves domestic supply capacity and reduces the inflationary import dependence that undermines trade balance performance (Afonso & Jalles, 2014; UNCTAD, 2019).

Thirdly, monetary authorities should aim to maintain moderate and predictable inflation rather than excessively contractionary policies that suppress productive investment. Moderate inflation, when accompanied by productive government expenditure, can support real exchange rate competitiveness and stimulate domestic production without eroding external balance sustainability (Kamin & Rogers, 2000; Blanchard, 2017).

Fourthly, SSA countries should strengthen fiscal discipline and public expenditure efficiency through improved budgetary institutions, medium-term expenditure frameworks, and performance-based budgeting. Enhancing spending efficiency ensures that fiscal expansion translates into real sector productivity gains rather than consumption-driven import surges (Easterly, 2005; World Bank, 2023).

At the program level, governments should design and scale up sector-specific public investment programs that directly target trade-related constraints. Priority programs include transport and energy infrastructure development, agricultural value-chain upgrading, export-oriented industrial parks, and trade facilitation initiatives. These programs enhance the transmission of fiscal spending into improved trade outcomes (Rodrik, 2008; UNIDO, 2020).

Additionally, regional economic communities in SSA should intensify regional trade integration programs that leverage coordinated public spending to reduce trade costs and expand intra-African trade. Harmonized fiscal and inflation management frameworks under initiatives such as the African Continental Free Trade Area (AfCFTA) can amplify the trade-enhancing effects of government expenditure across borders (UNECA, 2021).

Furthermore, capacity-building programs for fiscal and monetary institutions should be strengthened to improve macroeconomic policy coordination, data quality, and analytical capabilities. Such institutional investments are critical for translating macroeconomic policy interactions into sustained improvements in trade balance performance (IMF, 2018).

Future research could extend the present analysis by disaggregating government expenditure by functional and economic classification to examine how different types of spending such as capital versus recurrent, social versus economic interact with inflation to influence trade balance dynamics. This would provide more granular policy guidance on expenditure prioritization (Afonso & Jalles, 2014).

Further studies may also explore country-specific and sub-regional heterogeneity using panel-threshold models, regime-switching approaches, or case-study methodologies. Such analyses would help identify inflation thresholds beyond which fiscal expansion becomes trade-distorting rather than trade-enhancing (Hansen, 1999; Kremer et al., 2013).

Finally, future research could incorporate structural breaks and external shocks, such as commodity price cycles, financial crises, and pandemics, to better understand how the fiscal–inflation–trade balance relationship evolves under changing global and domestic conditions. Integrating political economy and institutional variables would further enrich the understanding of SSA's external sector dynamics.

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APPENDICES

Appendix 1: Descriptive statistics

	LNGEX	INF
Mean	21.30859	7.352015
Median	21.34483	5.692725
Maximum	25.14656	57.87695
Minimum	18.25531	0.040486
Std. Dev.	1.400755	7.41004
Skewness	0.527748	2.684718
Kurtosis	3.631006	13.82972
Jarque-Bera	25.20401	2435.227
Probability	0.000003	0
Sum	8523.436	2940.806
Sum Sq. Dev.	782.8835	21908.57
Observations	400	400

Appendix 2: Unit root test, LNTB (in Level)

Panel unit root test: Summary
Series: LNTB
Date: 12/23/25 Time: 03:14
Sample: 2005 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.36325	0.0004	20	360
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.78989	0.2148	20	360
ADF - Fisher Chi-square	50.4277	0.1249	20	360
PP - Fisher Chi-square	58.0121	0.0326	20	380

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 3: Unit root test, LNTB (in first difference)

Panel unit root test: Summary
Series: D(LNTB)
Date: 12/23/25 Time: 03:13
Sample: 2005 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.17086	0.0000	20	340

Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.35184	0.0000	20	340
ADF - Fisher Chi-square	112.028	0.0000	20	340
PP - Fisher Chi-square	146.681	0.0000	20	360

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 4: Unit root test, LNGEX (in Level)

Panel unit root test: Summary
Series: LNGEX
Date: 12/27/25 Time: 08:04
Sample: 2005 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.74757	0.0030	20	360
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.14779	0.5587	20	360
ADF - Fisher Chi-square	48.8793	0.1584	20	360
PP - Fisher Chi-square	69.4819	0.0026	20	380

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 5: Unit root test, LNGEX (in first difference)

Panel unit root test: Summary
Series: D(LNGEX)
Date: 12/27/25 Time: 08:05
Sample: 2005 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.08906	0.0000	20	340
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.27348	0.0000	20	340
ADF - Fisher Chi-square	115.028	0.0000	20	340
PP - Fisher Chi-square	203.967	0.0000	20	360

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 6: Unit root test, INF (in Level)

Panel unit root test: Summary
Series: INF
Date: 12/27/25 Time: 08:06
Sample: 2005 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	6.93810	1.0000	20	360
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	2.07029	0.9808	20	360
ADF - Fisher Chi-square	44.6631	0.2822	20	360
PP - Fisher Chi-square	62.3750	0.0133	20	380

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 7: Unit root test, INF (in first difference)

Panel unit root test: Summary
Series: D(INF)
Date: 12/27/25 Time: 08:07
Sample: 2005 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.60452	0.0000	20	340
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-7.56337	0.0000	20	340
ADF - Fisher Chi-square	149.991	0.0000	20	340
PP - Fisher Chi-square	684.903	0.0000	20	360

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 8: Generalized Method of Moments (GMM) model results

Dependent Variable: D(LNTB)
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 12/27/25 Time: 08:46
Sample (adjusted): 2008 2024
Periods included: 17
Cross-sections included: 20
Total panel (balanced) observations: 340
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)

Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(D(LNTB),-2) D(LNGEX)*D(INF) (-1)
Constant added to instrument list

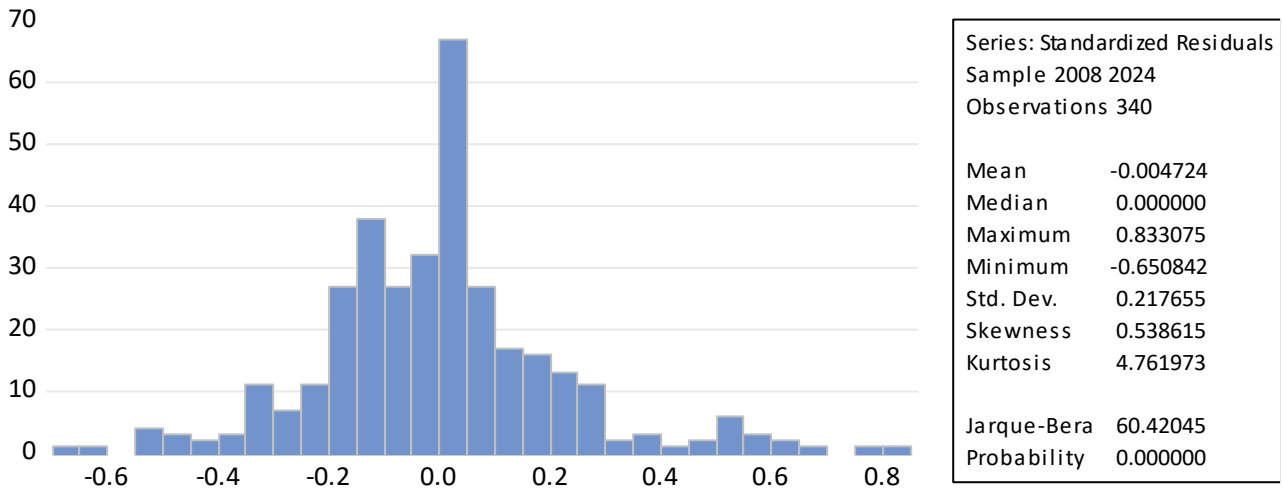
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNTB(-1))	0.197344	0.019376	10.18477	0.0000
D(LNGEX)*D(INF)	0.033026	0.001346	24.54325	0.0000

Effects Specification

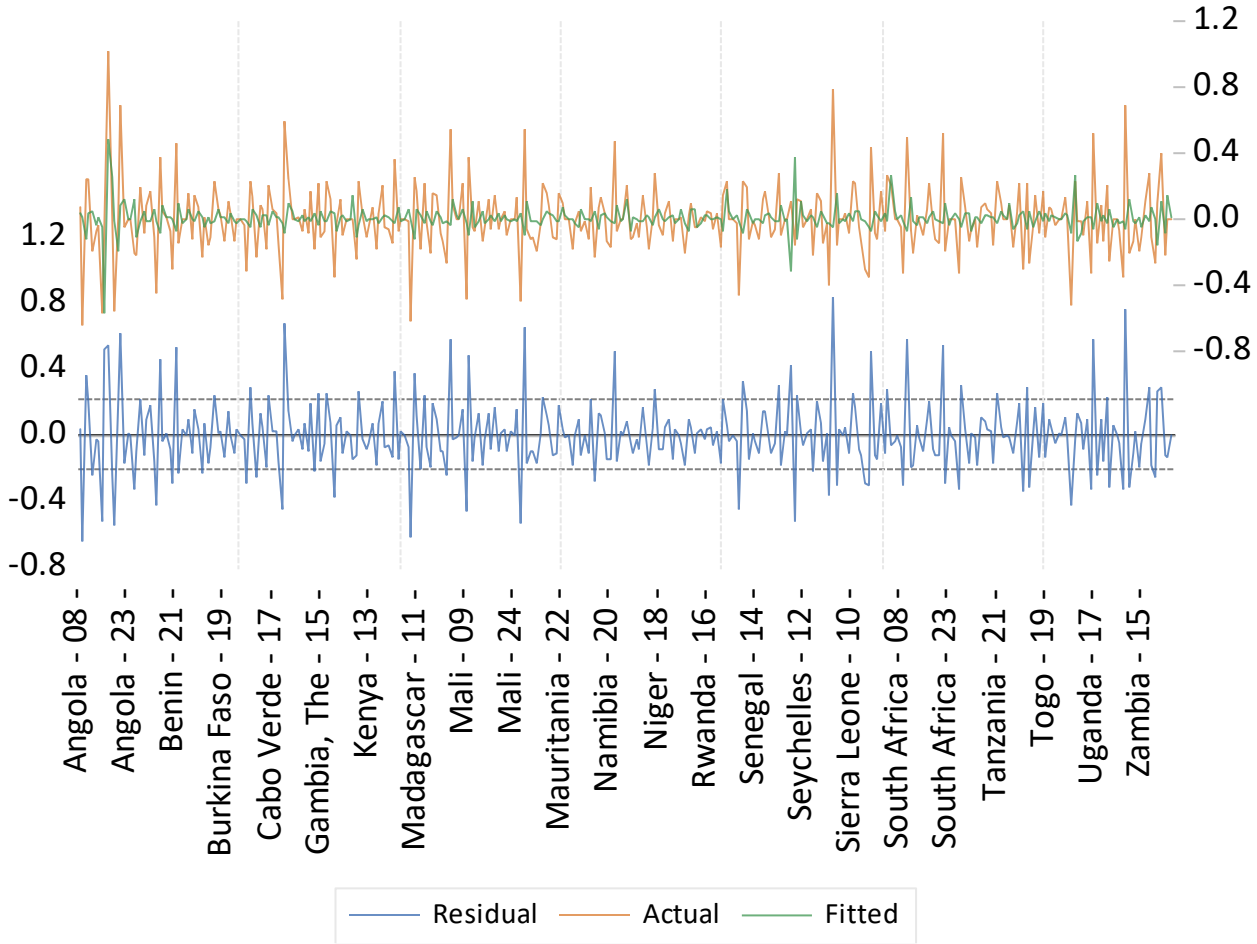
Cross-section fixed (first differences)

Mean dependent var	-0.003348	S.D. dependent var	0.206568
S.E. of regression	0.218028	Sum squared resid	16.06728
J-statistic	18.43366	Instrument rank	20
Prob(J-statistic)	0.427447		

Appendix 9: Normality test



Appendix 10: Graph of residuals



Appendix 11: Serial Correlation Test

Arellano-Bond Serial Correlation Test
Equation: Untitled
Date: 12/27/25 Time: 08:53
Sample: 2005 2024
Included observations: 340

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	-4.415369	-6.310750	1.429269	0.0000
AR(2)	NA	-2.574267	NA	NA

*Standard errors could not be computed. Try different covariance matrix options

Arellano-Bond Serial Correlation Test
Equation: Untitled
Date: 12/27/25 Time: 08:53
Sample: 2005 2024
Included observations: 340

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	-4.415369	-6.310750	1.429269	0.0000
AR(2)	NA	-2.574267	NA	NA

*Standard errors could not be computed. Try different covariance matrix options

Appendix 12: List of Sub-Saharan Africa countries in the study

Angola	Gambia, The	Mauritania	Senegal	Tanzania
Benin	Kenya	Namibia	Seychelles	Togo
Burkina Faso	Madagascar	Niger	Sierra Leone	Uganda
Cabo Verde	Mali	Rwanda	South Africa	Zambia

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Talent Management Practices and Performance of MDAs in Uganda

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Abstract: This study aimed at examining the effect of talent management practices on the performance of Ministries, Departments, and Agencies (MDAs) in Uganda with four objectives that were designed to examine talent acquisition, talent development, performance management, and succession planning in MDAs in Uganda. This study used a positivism paradigm and applied a sequential mixed-methods explanatory research design in which data were collected through cross-sectional survey research design and analyzed using Pearson correlation and hierarchical regression analysis, with thematic data analysis used in analyzing data collected in the quantitative section of this research. Regression results indicate that talent acquisition significantly and positively affects MDA performance in Uganda ($B = 0.246$, $p < .01$), as do talent development ($B = 0.142$, $p < .01$) and performance management ($B = 0.414$, $p < .01$), which is the highest of all factors. However, succession planning has a slight negative effect but is not statistically significant ($B = -0.003$, $p > .05$). Overall, the results indicate that the model is statistically significant and explains 37.6 percent of the changes in MDA performance in Uganda (Adjusted $R^2 = .376$, $F = 71.657$, $p < .01$). Based on the results, the importance of merit recruitment, staff development, and performance management is highlighted, as is the importance of succession planning and its potential to support MDA performance in Uganda. The results of the present study provide solid support to inform HR policy interventions geared towards improving the efficiency, effectiveness, accountability, and sound financial management of MDAs in Uganda's public sector.

Keywords: *Talent management practices, performance of MDAs, Uganda*

1. Background

The effectiveness of ministry, department, and agency (MDA) is of topmost importance in national development because these are the channels through which government programs and policies are implemented to provide services that are of benefit to the welfare of citizens (Knies, Boselie, Gould-Williams & Vandenabeele, 2024). Effective MDAs are therefore of topmost importance in ensuring effective service delivery, preventing wastage of public expenditure, and ensuring accountability, which in turn builds public confidence in the government (Halim, Wibisono & Mulyono, 2024). In this case, talent management is of topmost importance in ensuring that only capable employees are hired to deliver duties in executing institutional roles (Wenting, Hussain, Xinlin, Na & Alam, 2024). Person-Job Fit Theory offers an understanding of the ways in which the question of why ensuring an appropriate fit between workers' skills, values, and interests can be appreciated in enhancing performance outcomes (Huang, Yuan & Li, 2019). For example, effective talent management strategies in which candidates are matched with job roles are of topmost importance in enhancing effectiveness and ensuring an appropriate fit between organizational needs and employees' capabilities (Bonet & Hamori, 2017). Recruitment software enabled through analytics also facilitates the identification of the workforce whose talent is closely aligned with the organizational needs, hence promoting organizational effectiveness (Palshikar, Srivastava, Pawar, Hingmire, Jain, Chourasia & Shah, 2018). Talent acquisition undertaken properly ensures that MDAs are not only staffed but staffed with people who are capable of delivering organizational goals, hence promoting value for money (Oueidat, 2022). Across the globe, there is evidence showing that governments whose talent acquisition and placement is closely aligned with organizational goals are likely to enjoy high levels of performance and satisfaction among the citizens (Karunathilaka, 2020). Under this perspective, the theory argues that the matching of workers with their respective professions is not just a personnel issue but an institutional one aimed at promoting performance (Opada, Ibrahim, Irawan, Akbar & Rasyid, 2024).

The development of talent also highlights the determination of the performance of MDAs. This is because, through the persistent development of the ability, potential, and know-how of the employees, the institution is able to ensure that its employees are able to keep up with the changing policy, technology, and administrative demands (Subotnik, Olszewski-Kubilius & Worrell, 2019). This is evidence of the Person-Job Fit Theory, which indicates that the performance of the employees improves when the changing abilities of the employees are

able to keep up with the demands of their respective jobs (Mensah & Bawole, 2020). It has been shown through research that talent development programs improve the engagement of the employees at all levels and create the institutional memory that is essential in sustaining the performance of the MDAs (Kaliannan, Darmalinggam, Dorasamy & Abraham, 2023). Secondly, continuous professional development helps employees maintain compatibility with organizational goals, thus boosting the efficacy of strategy implementation, accountability, and service delivery performance (Rezaei & Beyerlein, 2018). Research also indicates that organizations that develop talent holistically realize higher innovation and resilience to be able to adapt to challenges and maintain performance levels (Kwon & Jang, 2022). Research in the banking and corporate sectors also confirms that developing talent leads to operational effectiveness in making employees competent, motivated, and goal-oriented towards organizational targets (Aina & Atan, 2020). Therefore, talent development rooted in the provisions of Person-Job Fit Theory is a continuous strategic tool for realizing sustained high performance in public organizations (Gallardo-Gallardo, Thunnissen & Scullion, 2020).

Performance management and succession planning enable the acquisition and development of talent through the direct relationship between individual efforts and organizational outcomes, and the assured succession of leaders (Gerrish, 2016). Performance management systems that include goal setting, feedback, appraisal, and reward enhance efficiency, effectiveness, and accountabilities in MDAs (Gomes & Mendes, 2023). Person-Job Fit Theory is exemplified through the experience that matching individual tasks and abilities with performance goals leads to increased individual engagement and productivity (Zhu, Zhu, Xiong, Ma, Xie, Ding, & Li, 2018). Succession planning ensures continuity through the development of staff to lead the MDAs in the future, hence avoiding disruptions in the course of organizational changes (Frimpong, 2022). This is supported by the experience of Ghana and Tanzania, where the implementation of succession plans has been shown to improve organizational resilience, staff morale, and continuity of service (Karikari, Kodi, & Poku, 2020; Wanje, 2022). Lack of effective succession planning has been shown to create performance gaps and ineffective accountability (Mohamed, 2022). Across the globe, MDAs that incorporate all the elements of talent management into their human resource systems have been shown to improve their operational performance, improve their compliance with the budget, and enhance the quality of service (Knies et al., 2024). Across Africa and East Africa, performance-related reforms that incorporate the linkage between HR practices have shown significant progress, although challenges still exist in the implementation and the allocation of resources (Mwamanda, 2023; Gorman & Dwumoh, 2022). Within Uganda, research has shown that MDAs that utilize the systematic recruitment of talent, staff development, and performance monitoring improve their accountability, efficiency, and service delivery (Lugada et al., 2022; Nuwagaba et al., 2021; Mwesigwa & Oladapo, 2021). This supports the validation of the applicability of the Person-Job Fit Theory through the strategic talent management process to improve the performance of MDAs and Uganda at large.

2. Literature Review

Theoretical Literature Review

In order to gain more insights into the relationship between talent management and the performance of MDAs, the relationship could be understood through the perspective of the Person-Job Fit Theory. Person-Job Fit Theory, which was developed by Edwards in 1991, is founded on the assumption that the performance of the employees is greatly enhanced if there is a high level of correspondence between the person's ability, interest, and value system and the job's requirement and need. This is because if the employees feel they are well fit in their respective positions, they get motivated and become productive, hence the performance of the organization is improved (Huang, Yuan & Li, 2019). This theory has also shown that if there is no correspondence between the person and his/her job, the outcome is dissatisfaction with the job, low job satisfaction, and low efficiency (Mensah & Bawole, 2020). With the case of MDAs, the theory shows how the employees are able to perform well in their respective positions, hence the enhancement of their performance. Organizations that utilize systematic approaches in directing the employees' skills to the job tasks are shown to perform well (Zhu et al., 2018).

Huang, Yuan & Li (2019) applied the Person-Job Fit Theory to examine employees' skills-job demands fit and its impact on innovation behavior. The results indicated that employees with a very good match between their strengths and their jobs were extremely creative, highly motivated, and more inclined to contribute positively to organizational performance. They further found that job involvement and career commitment stabilized this relationship, proving that fit between a person and his or her work encourages innovation and long-term

commitment. Mensah & Bawole (2020) also explored person-job fit within the public organizations of Ghana through an analysis of its mediating role between talent management and employee outcomes. They discovered that increased person-job fit leads to increased job satisfaction, commitment, and productivity and therefore forms a critical component of public organizations seeking to increase efficiency and accountability. Zhu et al. (2018) extended the application of data-driven methods to further improve person-job matching using joint representation learning. Their findings confirmed that organizations that use such models achieve better talent alignment, leading to improved recruitment and performance.

Qin et al. (2018) developed an ability-conscious neural network model with the objective to improve recruitment processes via individual ability matching against specific job specifications. As reported by their study, in line with the fact that companies focus on person-job fit, turnover reduces and overall performance enhances. Qin et al. (2020) expanded upon this idea by proposing a sophisticated neural network model that considered the employee traits and occupational features, and found that companies implementing this model experienced improved performance indicators and job stability. Sun et al. (2021) also expanded upon the idea with their study on person-organization fit using structure-aware attentive neural networks. They found that firms that match employees' potential with strategic goals not only enhance engagement but also achieve higher institutional performance. Those studies as a whole illustrate that the Person-Job Fit Theory offers a useful framework for understanding how matching individual ability with job roles enhances performance in MDAs because proper matching drives motivation, innovation, and organizational success.

Empirical Literature Review

Talent Acquisition and Performance of MDAs

In the understanding of the relationship between talent management practices and performance, talent acquisition is at the core of the organizational outcomes. Wenting et al. (2024) is an example of how analytics-based talent acquisition improves the precision of talent acquisition, turnover reduction, and performance management. This is because the findings indicated that analytics assist the organization in selecting the best talent whose talent strengths match the organizational needs, hence increasing the effectiveness of the organization. However, the findings were more inclined towards private tech-based firms and could not be directly applied to public institutions such as the MDAs in Uganda, which are likely to be slow-moving and have minimal digital infrastructure. Similarly, in a theoretical study, Bonet & Hamori (2017) recognized that not only is recruitment an organizational process but also a strategic one. The study recognized that organizations that integrate their recruitment with organizational goals have been able to develop a dedicated and skilled workforce, which in return translates into organizational performance. Although the study was not tested, it is evident that it provides a conceptual model that public institutions could adopt in their efforts to transform recruitment from its traditional reactive, ritualistic approach to more strategic recruitment. Palshikar et al. (2018) also emphasized analytics-based recruitment. The study demonstrated how data systems could be used in reducing biases in recruitment, making it faster, and enhancing job fit. The study provides empirical evidence on how recruitment could be made more objective and performance-oriented. Therefore, it is evident that talent acquisition, being a strategic approach, could be effective in enhancing value for money in Uganda's MDAs, although it is subject to contextualization.

Oueidat (2022) analyzed the recruitment of talents in the organization by conducting quantitative regression analysis to reveal the interaction between recruitment practice and productivity, service delivery, and employee retention. A positive correlation was established with the observation that the organizational culture and leadership played a critical role in the quantification of the recruitment process. Vadithe & Kesari (2023) carried out a systematic review of the application of HR analytics in the recruitment of talents. The application of analytics in the recruitment process was seen to improve fairness and speed in the recruitment process and the quality of the candidate-organization fit. However, it was also seen that the application of technology in the recruitment process was not enough to improve organizational performance. Karunathilaka's (2020) research on the role of talent acquisition as a strategic business tool revealed that organizations that strategically align recruitment with organizational goals have better productivity and innovation. The research emphasized the importance of recruitment that does not only consider skills but also cultural aspects. The three studies reveal that the effectiveness of recruitment is largely dependent on the strategy, leadership, culture, and technology that are all integrated. The implications of these studies for the MDAs in Uganda are that better recruitment

outcomes are not just about the rules and regulations in place but also about the systemic approach that needs to be taken.

Opada et al.'s (2024) study examined the recruitment policy and talent acquisition strategies wherein openness and meritocracy in recruitment processes can significantly enhance the workers' productivity and organizational effectiveness. The mixed-methods approach revealed that harmonization of recruitment practices and organizational objectives minimizes nepotism and boosts accountability in institutions such as MDAs in Uganda. Anita (2019), in her conceptual paper, established a conceptual model of strategic talent acquisition through scientific steps in the recruitment process, such as workforce planning, employer branding, employee engagement, and post-hire assessment. Although not based on empirical data, the author offered practical suggestions in developing a system of recruitment that maximizes the performance of employees and minimizes turnover rates. Thakur & Sanjrani (2024), in their empirical study of the banking sector in Pakistan, statistically proved that recruitment processes planned and implemented in organizations can significantly motivate employees and enhance their productivity in organizations. The three studies show that recruitment is not only open but also strategic and regularly monitored in organizations. The MDAs in Uganda can benefit greatly from the principles of recruitment and talent acquisition in terms of enhanced efficiency, accountability, and value for money, and having an efficient workforce in delivering quality services to community.

Talent Development and Performance Of MDAs

Talent development is an essential driver of organizational performance, and the MDAs in Uganda are not exempted. Subotnik, Olszewski-Kubilius & Worrell (2019) explored the psychological aspects of high performance and explained the role of talent development in fostering unique talents in employees of an organization. The authors explained that talent development is not just training but also involves mentoring, challenging, and exposing employees to opportunities, discovering individual potential, and matching it with organizational objectives. The authors explained that when workers are provided with the right opportunities and support, the organization will reap more innovation, productivity, and motivation. An empirical study on the effect of talent development on organizational performance was carried out by Wesonga & Van Der Westhuizen (2024). The study confirmed that talent development programs have a significant positive effect on employee competence, staff retention, and service delivery performance through the survey method and regression analysis. This study was evidence that talent development programs result in improved efficiency and effectiveness in organizational performance, which is crucial for public organizations like MDAs. Another study by Mwanzi, Wamitu, & Kiama (2017) showed that talent management, in terms of talent development, leads to organizational development. The study showed that talent development is crucial in developing employees in an organization, and it leads to organizational development. The study showed that talent development in an organization leads to creativity and enhances organizational outcomes. The study showed that talent development in an organization leads to creativity and enhances organizational outcomes. This proves that talent development is crucial in improving performance in an organization, and in MDAs in Uganda, it is crucial in improving accountability and enhancing efficiency and effectiveness.

The importance of talent development was also studied by Rezaei & Beyerlein (2018) through a systematic review of empirical research in a literature review, which emphasized the importance of formal training, coaching, mentoring, and experience-based learning integration. It was proposed that cooperation between development programs and individual potential, as well as organizational goals, is essential for the achievement of performance improvements. Kaliannan, Darmalinggam, Dorasamy, & Abraham (2023) emphasized the importance of inclusive talent development, stating that the guarantee of access to development opportunities for various employee groups is essential for workforce engagement, capability, and performance. The study demonstrates the importance of inclusivity for workforce capacity as well as fairness, which is essential in public institutions. Kwon & Jang (2022) provided a critical analysis of talent development practices. They emphasized that unless there is alignment with organizational culture, there would be no significant outcomes from talent development. Kwon & Jang (2022) also emphasized that there is a possibility that employees could be demotivated or that performance could be enhanced up to a certain point if there is a top-down approach. From all three studies, it is evident that there is a need for inclusiveness in talent development strategies. For the MDAs in Uganda, there is a need for development interventions that go beyond basic training.

Gallardo-Gallardo, Thunnissen & Scullion (2020) undertook an investigation on the impact of context in the implementation of talent management. The study showed that the effectiveness of development programs is largely dependent on organizational culture and structural readiness. The study showed that the adoption of talent development practices in another context must be undertaken with utmost caution. Aina & Atan (2020) provided empirical evidence that organizations that adopt integrated talent development practices are able to realize long-lasting productivity improvements. The study showed that although development should be integrated in the organizational strategy, it should not be undertaken in isolation. Hongal & Kinange (2020) provided an empirical summary that showed evidence that strategic investment in the development of employees' talents is important in improving the efficiency and effectiveness of the organization. In general, these studies indicate that the development of employees' talents in the MDAs in Uganda is important in the development of an efficient and effective workforce that is able to provide quality services.

Performance management and performance of MDAs

Performance management is becoming increasingly aligned with institutional responsibility and effectiveness, especially in public organizations such as MDAs. Gerrish (2016) carried out a meta-analysis with the objective of finding out the level of effect of performance management systems on the overall performance of organizations in various public institutions. From the findings of Gerrish's analysis, it is evident that organizations with formalized performance management systems are likely to display efficiencies in terms of accountability and quality of service. Gerrish has also highlighted the fact that performance management is not only an assessment process but also a process of learning and improvement if done correctly. Gomes & Mendes (2023) also studied the organizational context in the application and impact of PMPs. Leadership support, employee participation, and evidence-based decision making were seen to be pivotal in making PMPs effective in the organizations studied. The researchers found that organizations that apply PMPs as development rather than punitive tools were seen to be more effective in aligning personal and organizational goals. Nduati & Wanyoike (2022) studied the application of employee PMPs and organizational effectiveness. The researchers found that transparent PMP goals, regular feedback, and developmentally focused evaluations were seen to be important in increasing organizational effectiveness. The reports indicate that it is the presence of performance rather than the presence of PMPs that is important in increasing the contribution of PMPs to organizational effectiveness. The application of transparent and participatory PMPs in the MDAs in Uganda could be important in increasing the effectiveness of the MDAs.

In addition, Bristol-Alagbariya, Ayanponle & Ogedengbe (2022) undertook an analysis of how the utilization of advanced performance management systems would improve productivity. They were motivated by technology and analytics applications in performance tracking. They found that data-based applications provide real-time feedback and better strategic decisions. They found digital transformation to provide efficiency and transparency in public organizations, which are both required. Almulaiki (2023) undertook an analysis of the effect of performance management on employees' performance in the context of Saudi Arabia. They found, in agreement with other researchers, that formal goal-setting, monitoring, and appraisal are to blame for employees' satisfaction. They undertook an analysis of the motivational effect of fair and transparent systems to attain individual outputs. Thneibat & Sweis (2023) undertook an analysis of how rewards based on performance and development evaluations trigger creativity through heightened motivation among employees. They found that linking rewards with evaluations of performance creates a performance-driven culture. All these research studies provide credible evidence of how current performance management systems, with the support of technology and fair measurement processes, can revolutionize performance. For MDAs, it is recommended that computerized monitoring systems and linking performance with rewards and career advancement can revolutionize public sector effectiveness.

Van Waeyenberg, Peccei & Decramer (2022) addressed the issue of the relationship between performance management and teacher performance, and they concluded that emotional commitment and low burnout are inevitable mediators of being productive. The study concluded that employees' performance and engagement levels are significantly improved if employees feel valued and appreciated through positive feedback and goals. Feruke, Olowookere & Ibrahim (2025) considered the practice of financial management and MDAs performance in Nigeria, and the study concluded that well-advanced performance monitoring systems in financial management result in better resource utilization. The study concluded that practice in performance management, especially financial operations, affects the efficiency of institutions. Matheka & Kosgei (2025) also

considered the practice of performance management in county governments in Kenya, and the study concluded that performance reviews regularly and financial performance indicators result in institutional credibility. The common factor of all these studies is that performance management is important for leading to transparency and accountability in institutions. In this regard, performance management in MDAs of Uganda should not only be focused on performance evaluation but also incorporate feedback, e-monitoring, and capacity building for leading to high performance.

Succession planning and performance of MDAs

In the quest to ascertain the impact of talent management practices on organizational performance, it is interesting to learn about the contribution of succession planning, which is the mainstay of organizational stability. Frimpong (2022) undertook an exploration of the succession planning practices of the Ghana Education Service in Asante Akim South and found that the implementation of succession planning improves the performance of the institution. Using the descriptive survey research design, the study revealed that the implementation of leadership development and mentorship programs in the institution motivated the employees and led to organizational transformation. Karikari, Kodi, & Poku (2020) also conducted a study on succession planning as a means of organizational development in the University of Education, Winneba-Kumasi, which revealed that through planned leadership succession, there is minimal interference with organizational performance. It was revealed that through deliberate capacity building and mentorship, the workforce becomes committed to their roles, thus making the organization more efficient in the long run. Gorman & Dwumoh (2022) also wrote about succession planning in the Technical Universities of Ghana, which revealed that although most of the institutions recognized the importance of succession planning, it was conducted sporadically and in an informal manner. Through this, there was a leadership vacuum, which made the organizations ineffective. All of the above research works, therefore, highlight that for public organizations such as MDAs in Uganda, there is a need for formalized succession planning through training, mentorship, and leadership grooming.

Mohamed (2022) studied the impediments to succession planning in the public health sector in Tanzania, with the case of Kinondoni Municipal Council. The author acknowledged that the performance of institutions in the public sector is often impaired by the failure to establish processes of leadership succession. Another author, Wanje (2022), also studied the effect of succession planning on the performance of employees in the Kilifi County Government in Kenya using a mixed method of research. The author established that succession planning improves the level of productivity and accountability of employees, especially when tied to training and promotion opportunities. Employees who have a clear line of progression in their organizations are more committed to their work and perform better. The discussion of succession planning in organizations is further enriched by the study of Wonnia (2021), who studied succession management in the public universities of Ghana and established that mentorship, leadership development, and talent management are integral parts of effective succession management in organizations. The author established that most of the universities in Ghana operated ad hoc leadership selection processes that impaired their performance and continuity. In combination, these studies illustrate that succession planning enhances performance through reduced uncertainty and the establishment of a leadership pipeline that guarantees the smooth running of institutions, a framework that can be used by Uganda's MDAs to enhance public service delivery.

Mwamanda (2023) also carried out an analysis of the role of succession planning practices in ensuring retention of employees in public colleges in Tanzania, using the case of the Tanzania Public Service College. It was found that succession planning is an effective way of ensuring retention of employees. Siambi (2022) carried out an extensive review of existing literature on succession planning in organizations. In his review, Siambi emphasized the importance of succession planning in aligning organizational goals with the capabilities of leaders. He further emphasized that in public organizations, the absence of active succession planning mechanisms is considered to cause disruptions in organizational functioning, which is equivalent to causing loss of morale. In another study carried out by Martin & O'Shea (2021) on succession planning in healthcare organizations, it was found that active succession planning in healthcare organizations prevents loss of knowledge. It was further emphasized in this study that organizations with active mechanisms of leadership development are considered to be stable despite management changes. Thus, it can be emphasized that by using such findings, it can be ensured that performance improvement is sustainable in organizations such as MDAs through institutionalization of such practices, which are independent of individual leaders.

Ikechukwu & Enudu (2022) researched the influence of succession planning on the performance of family firms in Enugu State and established that planned leadership successions sustain organizational culture, consistency, and efficiency of operations. Though they were concerned with the private sector, their observation highlights the overall importance of leadership continuity in institutions. Salau & Nurudeen (2022) in their study on succession planning as a means for small and medium-sized businesses in Nigeria to achieve growth as generational businesses identified that organizational culture also has a part to play in facilitating successful leadership successions. Bano (2023) in her study on best practices in succession planning identified that it is also effective for small businesses, as it is for larger businesses, for succession planning to be incorporated into overall human resource practices. Through this study, it was identified that for small businesses, it is effective for employees who have higher potential to be identified and provided with leadership development training. This means that for MDAs in Uganda, it is essential for value for money, accountability, and effective delivery to be maintained through a formal system of succession planning that is open and based on training and culture.

3. Methodology

The study was conducted using a positivist paradigm, which is based on the assumption that organizational practices and performance can be measured well using real data (Creswell, 2014). The study was conducted using a sequential explanatory mixed-methods design, which started with quantitative data collection using cross-sectional survey design to explore the relationship that exists between talent management practices and the performance of MDAs in Uganda (Saunders, Lewis, & Thornhill, 2019). This was then followed by qualitative study that aimed at explaining what was revealed from the data (Creswell & Plano Clark, 2011). The study was conducted in 146 MDAs in Uganda, with 103 being selected using proportionate stratified sampling in combination with simple random sampling in order to ensure that all ministries, agencies, and departments were adequately covered (Krejcie & Morgan, 1970). Data was collected from senior executives, heads of departments, human resource managers, etc., using structured questionnaires that were then followed by an interview with key stakeholders (Bryman & Bell, 2015). This increased the validity of the study using triangulation, which provided a deeper understanding of talent management practices in MDAs (Denzin, 1978; Greene, Caracelli, & Graham, 1989; Tashakkori & Teddlie, 2010).

Quantitative analysis of the quantitative data was carried out using SPSS, where Pearson correlation analysis was used to evaluate the nature of the relationship that may exist between the dimensions of talent management and the performance of MDAs. Ordinary least squares regression analysis was also carried out to evaluate the predictive value of the dimensions of talent management on the performance of MDAs (Gujarati & Porter, 2009; Field, 2018).

4. Results

Of the 103 MDAs sampled, 92% responded, which is 95 for analysis. If we consider how long these MDAs have been in existence, it is evident that almost half of them, 46%, have been in operation for over 15 years. This implies that these organizations are quite established. A further 28% have been in operation for 10 to 15 years, 18% for 5 to 10 years, and only 8% are relatively new in the sense that they have less than five years of operation. In terms of sources of funds, it is evident that 54% of these organizations are mainly funded through budget allocations from the government. A further 21% are funded through a combination of money from the government, donor agencies, and money generated internally. A further 15% are mainly funded through donor agencies, and 10% through money generated internally. In terms of location, it is evident that 42% of these organizations are based in the Central Region, followed by 29% in the Western Region, 17% in the Eastern Region, and 12% in the Northern Region.

When you look at the manner in which these MDAs are operating, it is evident that most of them, 61%, are operating at the national level. The others are scattered in that 19% are operating at the regional level, 13% at the district level, and 7% at the local level. On the other end, in terms of budgets, it is also notable that a significant number, 38%, are operating with budgets that exceed UGX 2 billion. Then there are 24% that are operating within the budget range of UGX 1.5-2 billion. Another 18% are operating within the UGX 1-1.5 billion budget. 12% are operating within the budget range of UGX 500-1 billion. The remaining 8% are operating at budgets that are below UGX 500 million. When you look at the sectors in which these MDAs are operating, it is

notable that most of these MDAs are in the service sector, 57%. The second highest number is in the agricultural sector, 28%, and then industry at 15%. When it comes to ownership, it is also notable that 63% are fully owned by the government. Then 24% are operating as semi-autonomous agencies. 13% are operating as parastatals.

Correlation results

This section presents the correlation results showing the relationship between talent management practices and the performance of MDAs in Uganda. The analysis highlights the direction and strength of the associations among the study variables and indicates which relationships are statistically significant.

Table 1: Correlation results

Variables	1	2	3	4	5	6	7	8	9
Talent acquisition-1	1								
Talent development-2	.228**	1							
Performance management-3	.020	.192**	1						
Succession planning-4	.094*	.057	.176**	1					
Efficiency-5	.158**	.141**	.220**	.170**	1				
Effectiveness-6	.339**	.248**	.216**	.129**	.494**	1			
Fiscal compliance-7	.295**	.340**	.346**	.071	.490**	.713**	1		
Accountability-8	.107*	.270**	.758**	-.039	.104*	.181**	.320**	1	
Performance of MDAs-9	.311**	.341**	.507**	.113*	.706**	.626**	.677**	.522**	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Talent acquisition and performance of MDAs in Uganda

The results in Table 1 indicate that talent acquisition has a significant and positive relationship with the performance of MDAs in Uganda ($r = .311$, $p < .01$). This implies that any positive change in talent acquisition practices is associated with a positive change in the performance of MDAs in Uganda.

Talent development and performance of MDAs in Uganda

The findings further indicate that talent development has a significant and positive relationship with the performance of MDAs in Uganda ($r = .341$, $p < .01$). This suggests that any positive change in talent development is associated with a positive change in the performance of MDAs in Uganda.

Performance management and performance of MDAs in Uganda

The results also show that performance management has a significant and positive relationship with the performance of MDAs in Uganda ($r = .507$, $p < .01$). This implies that any positive change in performance management systems is associated with a positive change in the performance of MDAs in Uganda.

Succession planning and performance of MDAs in Uganda

Finally, the findings indicate that succession planning has a significant positive relationship with the performance of MDAs in Uganda ($r = .113$, $p < .05$). This implies that any positive change in succession planning is associated with a positive change in the performance of MDAs in Uganda.

Table 2: Regression Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.391	.192		2.036	.042
	Talent acquisition	.246	.036	.258	6.859	.000

	Talent development	.142	.028	.193	5.053	.000
	Performance management	.414	.034	.465	12.325	.000
	Succession planning	-.003	.036	-.004	-.095	.924
R	.618[a]					
R Square	.381					
Adjusted R-Square	.376					
F	71.657					
Sig.	.000[b]					

a. Dependent Variable: Performance of MDAs

This shows that talent acquisition has a positive and statistically significant effect on the performance of MDAs in Uganda. This implies that if there is an increase in talent acquisition by one unit, there will be a corresponding increase in the performance of MDAs in Uganda by 0.246 units.

The findings have also shown that talent development has a positive and statistically significant effect on the performance of MDAs in Uganda (B = .142, p < .01). This implies that if there is an increase in talent development by one unit, there will be a corresponding increase in the performance of MDAs in Uganda by 0.142 units. The findings have also shown that performance management has a positive and statistically significant effect on the performance of MDAs in Uganda (B = .414, p < .01). This implies that if there is an increase in performance management by one unit, there will be a corresponding increase in the performance of MDAs in Uganda by 0.414 units. This is the strongest predictor of MDA performance of all the variables. The findings have also shown that succession planning has a negative but statistically insignificant effect on the performance of MDAs in Uganda

5. Discussion and Recommendations

Discussion

The results of the present study are generally in line with the Person-Job Fit Theory and previous empirical findings in the literature. The significant positive relationships of talent acquisition, talent development, and performance management with the performance of MDAs validate the importance of person-job fit in boosting the efficiency, effectiveness, accountability, and financial compliance of MDAs. The significant positive relationship of talent acquisition with the performance of MDAs also validates the findings of Oueidat (2022), Karunathilaka (2020), and Opada et al. (2024), which stress the importance of talent acquisition in boosting the productivity of MDAs. Similarly, the significant effect of talent development is in line with the studies by Wesonga and Van Der Westhuizen (2024), Subotnik et al. (2019), and Aina and Atan (2020), which establish the importance of competence, motivation, and service delivery in the context of talent development initiatives in MDAs. Performance management was established as the most significant predictor of MDA performance, which is in line with the arguments of Gerrish (2016), Nduati and Wanyoike (2022), and Gomes and Mendes (2023), who establish the importance of transparent goal-setting and performance monitoring systems in MDAs and other public institutions in general. On the other hand, the effect of succession planning was found to be statistically insignificant, which is in line with the arguments of Gorman and Dwumoh (2022) and Mohamed (2022), who establish that although succession planning is theoretically significant in MDAs, its lack of institutionalization and the bureaucratic and informal nature of succession planning in MDAs make it statistically insignificant in predicting MDA performance.

Recommendations

From the findings, the study recommends that MDAs in Uganda improve their merit-based and analytics-informed recruitment systems to improve person-job fit and eliminate inefficiencies due to the misplacement of human resources. There should be increased investment in talent development programs that link talent development with organizational performance goals. Performance management systems should be improved, considering their significant influence, by setting performance targets, using feedback mechanisms, and

incorporating digital monitoring technologies to improve transparency and accountability. Although succession planning was insignificant in the study, MDAs in Uganda should consider developing formal succession planning systems that link to leadership development, mentoring, and capacity building to improve sustainability of organizational performance. These improvements would increase value for money, accountability, and service delivery in Uganda's public sector MDAs.

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The Role of Corporate Governance in Municipal Risk Management: A Case Study of the Ehlanzeni District Municipality, Mpumalanga

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Abstract: Municipalities in South Africa continue to face criticism for weak governance systems and poor service delivery to communities. Many district and local municipalities struggle with financial management challenges, limited institutional capacity, and ineffective risk management practices. This study examines the relationship between corporate governance and municipal risk management in the Ehlanzeni District Municipality in Mpumalanga Province. The research focuses on four local municipalities within the district and explores how governance practices influence municipal performance and accountability. A mixed-methods approach was adopted to generate both quantitative and qualitative insights. Quantitative data were collected through a structured questionnaire administered to 216 municipal officials, while qualitative data were obtained through semi-structured interviews with 45 purposively selected participants. The quantitative data were analysed using the Statistical Package for the Social Sciences (SPSS) version 27, applying descriptive statistics, correlation analysis, ANOVA, and regression techniques. Qualitative data were analysed through thematic analysis to identify patterns related to governance roles, risk management processes, and institutional accountability. The findings reveal notable gaps in corporate governance knowledge and implementation across the municipalities. However, the principle of fairness emerged as a critical factor influencing municipal performance and stakeholder trust. The study recommends strengthening governance capacity through continuous training, improved stakeholder engagement, and better integration of corporate governance principles into municipal decision-making processes.

Keywords: *Corporate governance; municipal risk management; local government performance; audit committees; Ehlanzeni District Municipality*

1. Introduction

Corporate governance has become pivotal for institutional efficiency, ethical governance, and organisational responsibility in both public and private domains. This is especially true for South Africa, wherein local governments have constitutional developmental responsibilities and service delivery obligations (Sippola et al., 2023). Sippola et al. (2023) argue that good governance is concerned with responsive and responsible management, as well as reporting and control mechanisms that are essential for all municipal organisations. There have been major changes in South Africa since 1994, as the country has been transforming its municipalities from apartheid-era administrative bodies to democratically governed, responsive and developmental organisations (Hlatshwayo, 2023). Numerous municipalities still have governance deficits, even with the existence of a legal and governance framework (i.e., Municipal Finance Management Act, (MFMA, Act No. 56 of 2003); Municipal Systems Act (MSA, Act No. 32 of 2000); and the King Reports). Such governance deficits include a lack of effective risk management, poor control within the organisations, inadequate financial management, and a lack of effective service delivery (Maphangwa et al., 2024). These governance deficits indicate widening gaps between governance regulations and the actual implementation of these regulations, leading to ongoing instability in the municipalities.

The reports of King I, II and III have had considerable impact on corporate governance culture and practice in South Africa, particularly regarding sustainability, inclusion of constituency, management of risks, and ethical leadership (Madzonga 2023; Gavurova et al., 2022). However, obstacles to implementation abound, especially in municipalities where governance is undermined by political meddling, inadequate technical skills, and diffuse responsibility. King III Report particularly pioneered the integrated reporting framework and the 'apply or explain' principle that seeks to improve transparency but still allows for contextual flexibility (Bracci et al., 2021). Protests concerning services are sweeping the nation, often ignited by shortages of water, electricity, infrastructural decay, and ineffective government action (Global Risk Report, 2017). The Ehlanzeni District Municipality illustrates the challenges of the national system of governance, suffering from poor risk

management, irregularities in procurement, financial mismanagement, and an absence of human capacity. Such challenges exemplify the critical need for new, appropriate governance frameworks that allow for risk-sensitive governance.

The impact of corporate governance on the improvement of risk management for the implementation of ethical and effective systems of local governance within the Ehlanzeni District Municipality in South Africa is the focus of the report. South Africa continues to experience governance deficits that affect social cohesion, economic development, and institutional performance. Governance assessments consistently highlight the deterioration of state capacity and identify governance collapse as a significant national and global risk (Global Risk Report, 2017). Within this context, the local government sphere is widely regarded as the weakest tier of government, characterised by recurring service delivery failures, financial mismanagement, and limited administrative capability. Service delivery protests are frequently triggered by grievances related to inadequate water, sanitation and hygiene (WASH) services, electricity shortages, and the deterioration of basic infrastructure. Researchers attribute these persistent failures to inadequate leadership, poor technical capacity, and the absence of strong political will to prioritise people-centred service delivery (Thusi, Matyana & Jili, 2023).

Facing these national challenges, the Ehlanzeni District Municipality exhibits clear symptoms of poor governance. Considerable deficiencies remain in areas affecting institutional efficiency, including risk identification, supply chain management, financial oversight, and compliance processes. A weak and poorly coordinated governance framework, coupled with capacity limitations and political interference, significantly undermines the identification, management, and mitigation of risks. These factors contribute to insufficient documentation of risks and the absence of effective oversight mechanisms. Additionally, the inability to clearly delineate the roles performed by bureaucrats and council members diminishes accountability structures (Lee, 2022). The resulting community dissatisfaction and institutional vulnerability hinder the achievement of the municipality's developmental goals, and the integration of corporate governance principles into municipal risk management remains inadequate. The Municipality lacks governance-aligned mechanisms to detect and manage operational, financial, and service delivery risks effectively. Therefore, the integration of corporate governance practices is essential for strengthening organisational trust, restoring accountability, and improving risk management (Efunniyi et al., 2024).

Theoretical Framework

Theoretical perspectives of corporate governance are particularly useful in understanding and analysing governance practices in South African municipalities. The most influential are agency theory, stakeholder theory, stewardship theory, and institutional theory. Together, these approaches show how local government can be either enhanced or weakened.

Agency theory is concerned with the relationship between the principal (individuals or politicians) and the agent (local government and officials). It points out that the agents that have been given trust may behave opportunistically and will not work for the interest of the public (Al-Faryan, 2024). Within local government, agency theory espouses the value of sufficient control, internal and external, auditing, and reporting transparency, as well as accountability frameworks and performance management systems in the prevention of corruption, mismanagement and inefficiency (Nnko, 2023; Nkhabu, 2021). Bouckaert (2023) and Diamantis (2020) argue that good audit committees, real-time control of the budget and timely recording and reporting of results to the public can change the behavior of municipal staff to be more in line with the interests of the people.

The stewardship theory provides a more positive outlook concerning political and administrative leadership. Steinfeld (2023) and Ouma (2024) claim it is a leader's disposition to safeguard public assets and advocate for the greater good rather than engage in self-serving actions. This approach justifies governance models that are predicated on the presence and fostering of moral leadership, trust, and enhanced social responsibility. Rubin (2021) and Ahmad and Islam (2024) brought to attention public-service principles, sound judgment, and moral value as fundamental requirements for community leadership, which is necessary for effective stewardship.

Stakeholder theory enhances debates on governance by acknowledging that an even greater spectrum of constituents is impacted by municipal activities, including individuals, NGOs, local enterprises, and

international governmental bodies. This realisation emphasises that governance should be participatory and inclusive, as well as responsive, on a multiplicity of accounts (Mandiriza & Fourie, 2023). With regards to local governance in South Africa specifically, it means community engagements, joint planning, and iterative processes of feedback that sustain the integration of people's voices in governance (Msenge & Nzewi, 2021; Vyas-Doorgapersad, 2024). Stakeholder theory adds to municipal obligations in the areas of responsiveness, inclusivity, and social justice.

Institutional theory focuses on the influence of formal statutes, norms, and the broader socio-political environment on municipal actions. It draws attention to how instruments such as King IV, the Municipal Systems Act, and the MFMA shape administrative ethos and governance modes (Grossi & Argento, 2022; Chit & Vasudevan, 2024). It further clarifies undesirable governance conditions such as path dependency, systemic political inertia, and resistance to institutional change (Anačkov, 2024). These theorists provide corporate governance in South African localities with a conceptual foundation for understanding how institutional norms, rules, and political dynamics shape governance practices. This participation-oriented inclusiveness is supported by Stakeholder Theory; the control mechanisms and accountability by agency theory; ethical trust and motivation by stewardship theory; and the governance scope by institutional theory (Bui & Krajcsák, 2024; Steinfeld, 2023). The consolidation of such theories grants the most comprehensive theoretical framework to evaluate and enhance municipal risk governance and service delivery.

2. Literature Review

Corporate governance and good municipal governance

Corporate governance is an internationally recognised essential element for effective practice, ethical direction, and accountability in the public and private sectors. At the local level, it pertains to the control and management of public resources by councils, top managers, and administration systems (Zeemering 2021). Corporate governance is about the instructions, policies, and structures that facilitate, control and ensure accountability for the actions of an organisation, while a board of directors is the governance unit of an organisation that provides direction and control at the top (Ali, 2024; Department of Public Enterprises, 2012). Within the South African local government system, this involves the municipal council, mayoral committee, and senior management, comprising the municipal manager and chief financial officer, who run the entity, make policy decisions, and are accountable for policy implementation.

The South African Constitution (Act 108 of 1996), the Municipal Systems Act (32 of 2000), the Municipal Structures Act (117 of 1998), and the Municipal Finance Management Act (56 of 2003) make up the constitutional and legislative regime for effective governance at the local level. It is these regulations that require municipalities to attend to the primary needs of the people by enhancing and sustaining socioeconomic development and managing their resources responsibly and equitably (Robson, 2021; Mamokhere, 2024). Despite the existence of comprehensive legislation, South African municipalities have not been able to achieve these corporate governance goals. Even with codified regulations and standards in place, several local governments continue to face challenges in applying governance principles, resulting in persistent problems in service delivery, financial oversight, and municipal accountability (Hill, 2024; Kaywood, 2021).

The most recent studies suggest that participatory, transparent, and tech-based approaches are equally important for effective local government. Municipalities will not succeed without accountability. Draci and Laska (2023) suggest that towns should foster public participation at participatory community forums, town-hall meetings, and within a digital engagement platform, while also including representation from the underrepresented. Androniceanu (2021) suggests that to foster participatory governance, the municipality should make the budget, the expenditures and the plans for development public. Technology can greatly assist these processes.

Ncamphalala and Vyas-Doorgapersad (2022) and Islam and Sufian (2023) contribute to a clearer understanding of local government governance by demonstrating how corporate governance, compliance practices, and ICT-driven accountability tools interact within municipal systems. Their work shows that effective local governance requires not only formal compliance but also recognition of the complex and

interconnected nature of municipal structures. By highlighting these interdependencies, their framework helps explain why local government performance often reflects broader systemic challenges.

Governance risk integration and implementation frameworks

The integration of governance and risk management is a salient concern among scholars of public sector reform today. In South Africa and elsewhere, the public sector is warned that risk management systems that do not integrate management with governance are doomed to fail, and that governance systems which do not contextualise risk management are inadequate (Gavurova et al., 2022). Equally, the King II and King III reports emphasised the importance of risk management as a responsibility of the board to take a holistic approach wherein the integration of risk management, compliance, performance management, and strategic planning is essential. According to Primec and Belak (2022), governance is a matter of shifting to the creation of value and resilience, but in the argument of Gao and Yu (2020), leadership is about the management of the ecological, social and economic risks.

Integrated governance-risk frameworks are particularly important in the municipal context. Municipalities face multiple interrelated risks, such as poor financial management, poor service delivery, aging infrastructure, environmental risks, and political and social instability. Some training seminars, such as the SALGA Municipal Finance and Governance Workshop (2023) and the Risk Governance in Local Institutions (2022, University of Mpumalanga), highlight the need for context-specific and predictive risk-governance models, rather than models that are only reactive to risks that have already surfaced.

Considering these limitations, the Municipal Corporate Governance Implementation Framework (MCGIF) was created for the purpose of South African municipalities. The MCGIF encourages a more advanced, strategically focused, and morally acceptable style of governance and supports flexible processes and a more thorough system of implementation (Daiser & Wirtz, 2021; Mulaudzi et al., 2023). It seeks to equip the leaders of municipalities with the cognitive and analytical tools necessary to understand complicated governance issues, generate a variety of alternative solutions, and appreciate the ramifications of their solutions over time. The MCGIF will continue to innovate and create value through collaboration and adjust the perception of municipal stakeholders as politically powerful rather than regulatory compliant (Gorter, 2024).

Persistent gaps in South African local government practice

Regardless of the extensive legislation, the governance standards, and the new legislation, the MCGIF, numerous deficiencies still exist in the South African local government sphere. Governance failures, audits, and service delivery protest incidents are on the rise, while local government documents responsibility for socioeconomic development, responsible financial stewardship, and service delivery (Robson, 2021; Hill, 2024). There is uncertainty about local corporate governance as the Protocol on Corporate Governance in the Public Sector, which is almost exclusively confined to state-owned enterprises, does not provide meaningful guidance for local implementation (Mulaudzi et al., 2023; Hill, 2024).

These difficulties are exacerbated by political pressure. The Public Sector Working Group says mayors and councillors are generally not included in strategic planning and performance reviews, and local councils are often not positioned as advocates of good governance. The Municipal managers, by law, have to comply with financial and administrative policies, and this lack of accountability may be because council members are political party representatives rather than independent directors (Mamokhere, 2024; Kaywood, 2021). The triadic division of functions and responsibilities between councils, executive mayors, and administrators creates confusion, a lack of adequate checks and balances, and a lack of fulfillment of governance standards.

3. Methodology

The role of corporate governance and risk management in Ehlanzeni District Municipality was approached via a multi-method approach. Gamage (2025) outlines how an inductive strategy from the Research Onion and some interpretivist research philosophy contributed to the methodological framework. This integrated the quantitative and qualitative approaches and offered a more exhaustive appreciation of the intricacies of governance and its influence on risk management at the local level.

The interpretivist theory relies on the understanding that the governance process is affected by a variety of stakeholders' viewpoints, lived experiences, and the social meanings they create (Paudel, 2024). It was within interpretivism, however, that the narratives and viewpoints influencing governance of the local municipality, a significant component of the public sector, were most effectively reviewed, thereby shaping the subjective interpretations of the administrative and political components. This was consistent with the inductive strategy that supported the proposed conceptual innovations to derive from the information, with little or no influence from prior ideas (Proudfoot, 2023). Given the dearth of empirical evidence on the commitments of governance and risk within municipalities in South Africa, it was within the scope of inductive reasoning to derive patterns and relationships.

A `convergent parallel` framework incorporating mixed methods was designed. The use of a formalised questionnaire aimed at measuring the perceptions of risk management, accountability, and governance strategies of municipal employee groups (Wielicka-Ganczarczyk & Jonek-Kowalska, 2023). To explore the organisational perceptions, the situational problems and the experiences with the governance systems, semi-structured interviews were used. The combined strands of triangulation give the results a higher degree of validity and reliability and are of greater defendable value (Meydan & Akkas, 2024).

The aim of achieving an elaborate and contextual analysis of the governance and risk mechanisms in the Ehlanzeni District justified the selection of case-study methodology. Case studies facilitate the intensive analysis of particular types of complex institutional arrangements (Henk & Fallmyr, 2020). A variety of methods, such as surveys, interviews, and document reviews, were used to compare different data sources and improve internal validity. The existing governance and risk boundaries were defined in terms of their cross-sectional temporal scope (Kusano & Kemmelmeier, 2020). The study's target population comprised a total of 4,763 employees and council members from the municipalities of Bushbuckridge, Thaba Chweu, Nkomazi, and the City of Mbombela. Stratified random sampling was used in the quantitative part of the study to ensure fair representation of the different municipalities (Mweshi & Sakyi, 2020). For qualitative sampling, saturation was used to determine the final sample size was 45 participants, selected purposively for their rich information from the managerial and political echelons. The required sample size of 259 was calculated using a 90% confidence level and a 5% margin of error (Akkas & Meydan, 2024). A participant ought to have had a minimum of six months in the municipality for an adequate understanding of how governance operates.

Quantitative metrics concerning financial governance, accountability, and risk management were collected using a questionnaire consisting of multiple-choice questions and Likert scale measurements (Rehman & Hashim, 2021). Participants were interviewed using semi-structured interviews, which allowed them to discuss governance, auditing, and risk management issues in depth and to provide more detailed responses. The interviews were recorded with participants' consent, and additional field notes were taken. Quantitative data were analysed using SPSS (Version 28). In analysing participants' perceptions, a combination of ANOVA, t-tests, and descriptive statistics was used to reflect the data distribution. The nature of the relationships between governance variables and risk outcomes was examined using correlation and regression analyses. Qualitative data were thematically analysed using NVivo (Allsop et al., 2022).

Instruments were refined because of a pilot study with 10 participants at Mkhondo Municipality. Triangulation, detailed accounts, and the principles of credibility, dependability, and confirmability were employed to bolster the quality of the research (Ahmed, 2024). Ethics approval was granted by the Durban University of Technology Ethics Committee, and consent was granted by each of the municipalities involved. The participants were assured that the research was confidential and voluntary (Hwang, 2023).

4. Findings

This survey resulted in a total of 216 valid responses from employees based in all four towns involved in this survey. The data in Table 7 shows that the greater portion of the participants, totalling 76.4%, had secured jobs of a permanent nature. Subsequently, there was a smaller portion, 22.2%, that was on a contractual basis, while a very small portion of the employees, 1.4%, were categorised in the "other" job category. When it comes to the participants in this survey, in regard to their job position, 59.7% were classified as administrative respondents, while the rest, 40.3%, were professional staff, and this included employees in the specialised and/or technical fields.

Table 1: General Information of the Participants Summarised Overall (N=216)

Employment status	
Permanent	165 (76.4%)
Contract	48 (22.2%)
Any other	3 (1.4%)
Position	
Administration	129 (59.7%)
Professional	87 (40.3%)
Gender	
Female	135 (62.5%)
Male	81 (37.5%)
Age	
20-25yrs	12 (5.6%)
26-30yrs	29 (13.4%)
31-35yrs	32 (14.8%)
36-40yrs	76 (35.2%)
41-50yrs	50 (23.1%)
51+yrs	17 (7.9%)
Educational level	
Matric	29 (13.4%)
Honours/B.Tech	48 (22.2%)
Diploma/Bachelors	112 (51.9%)
Masters	25 (11.6%)
Doctorate	2 (0.9%)

The distribution of employment across levels of the organisation indicates that there is permanent employment and is dominant at the junior, middle and senior management levels, as shown in Table 1. This pattern suggests that there is a stable and mostly closed workforce within the municipal administrations. Most of the respondents are in the 36 - 40 year age group (35.2%) and the 41 - 50 year age group (23.1%), as shown in the age distribution in Fig. 8. The 20-25 year cohort (5.6%) and the 51+ years cohort (7.9%) presented with the lower percentages. This suggests that the sample is biased towards middle career and senior professionals and, hence, the municipalities are likely to have more institutional knowledge.

In this sample, 62.5% were women (Figure 9) and 37.5% men. This means that a majority of the employees in the municipalities studied were women. Almost half (51.9%) of the respondents had a diploma/bachelor's degree, 22.2% had an honours degree, or B. Tech, 13.4% with a master's degree, and less than 1% had a PhD (Figure 10). This means that a relatively small proportion of the highly skilled postgraduate group was represented, but a significant number of the staff have university qualifications.

Quantitative Findings

The quantitative aspect of the study focused on the differences concerning the perception of governance among the employee clusters, and the effect of certain governance variables on the prediction of municipal performance (Daiser & Wirtz, 2021). A number of important inferential results were obtained.

ANOVA: Employment Status and Governance Perceptions

One-way ANOVA has been employed to analyse the opinion of the permanent, contracting, and other staff. According to Table 8, there were no significant differences between the groups in relation to governance, risk-based internal auditing, transparency and communication, or internal audit oversight. However, in the case of the fit between budget and service delivery, there was a statistically significant difference, $F(2, 213) = 3.602$, $p = 0.029$. Table 9 illustrates that, compared to contractual staff, permanent employees expressed greater

agreement with the assertion that the interests of the community were considered in the municipal budget. Contracted employees showed greater expectations, which suggested lesser consideration in the budgeting and an absence of access to the controlling tier (Nechanska et al., 2020).

Table 2: ANOVA (Professional vs Administrative staff)

		Sum of Squares	Df	Mean Square	F	Sig.
B11	Between Groups	.155	2	.078	.070	.932
	Within Groups	234.980	212	1.108		
	Total	235.135	214			
C27	Between Groups	2.635	2	1.317	2.570	.079
	Within Groups	109.199	213	.513		
	Total	111.833	215			
C34	Between Groups	.057	2	.028	.040	.961
	Within Groups	151.277	213	.710		
	Total	151.333	215			
C28	Between Groups	1.295	2	.648	.867	.422
	Within Groups	159.034	213	.747		
	Total	160.329	215			
C47	Between Groups	4.173	2	2.086	3.602	.029
	Within Groups	123.364	213	.579		
	Total	127.537	215			

Table 3: Post Hoc Tukey HSD Results for Q47 (Budgets and Service Delivery)

Comparison	Mean Difference (I–J)	Std. Error	Sig.	95% CI (Lower–Upper)
Permanent vs Contract	0.32722*	0.12575	0.027	0.030 – 0.624
Permanent vs Other COM	-0.21888	0.44334	0.874	-1.265 – 0.827
Contract vs Other COM	-0.54610	0.45319	0.452	-1.616 – 0.523

Note: $p < 0.05$ indicates a significant difference.

ANOVA: Occupational Position and Governance Variables

Within the roles of Professional versus Administrative, variance analyses showcased two different focal points of significance (refer to Table 10). Professional roles reported perceptions of Audit Committee performance to be significantly higher than those of administrative roles, $F(1, 213) = 7.565$, $p = 0.006$. Their confidence diminished among stakeholders less than the administrative role, $F(1, 214) = 8.000$, $p = 0.005$. With respect to the variables risk-based internal audit, internal audit oversight, and budget alignment, there were no differences of significance. This tells us that those dealing with technical governance have a greater understanding of gaps to be filled in a process, while the administrative staff takes a more optimistic view of the municipal activities (Krpalek et al., 2021).

Table 4: ANOVA (Position and Perceptions of Governance Variables)

		Sum of Squares	df	Mean Square	F	Sig.
B11	Between Groups	8.065	1	8.065	7.565	.006
	Within Groups	227.070	213	1.066		
	Total	235.135	214			
C27	Between Groups	.295	1	.295	.566	.452
	Within Groups	111.538	214	.521		
	Total	111.833	215			
C34	Between Groups	5.454	1	5.454	8.000	.005
	Within Groups	145.880	214	.682		
	Total	151.333	215			
C28	Between Groups	.223	1	.223	.298	.586
	Within Groups	160.106	214	.748		
	Total	160.329	215			

C47	Between Groups	.312	1	.312	.525	.469
	Within Groups	127.225	214	.595		
	Total	127.537	215			

ANOVA: Education Level and Governance Perceptions

Additionally, Table 3 shows that perceptions of governance changed due to educational level. Distinct differences were found in audit committee engagement ($F = 8.600$, $p < 0.001$), stakeholder engagement ($F = 2.798$, $p = 0.027$), internal audits ($F = 6.806$, $p < 0.001$), and budget engagement ($F = 2.573$, $p = 0.039$). Those with higher credentials (Honours, Master's and Doctorate) had higher standards for MFMA compliance, more disapproval toward communication gaps, and more critical evaluation of internal audits and budgeting. In contrast, there were no educational category formal differences in risk-based internal auditing, indicating that the responses regarding the practice were relatively the same.

Regression Analysis: Governance Predictors of Municipal Performance

The study aimed to assess the effect of various aspects of governance on perceived municipal performance with regard to the alignment of budget and service delivery. A multiple regression analysis was performed and displayed in Table 5, where the predictors include (C34) the effectiveness of the audit committee, risk-based auditing, internal audit reviews, and transparency/communication.

The model summary (Table 5) shows that governance variables account for only 15.6% of the variation in performance ($R2 = 0.156$; Adjusted $R2 = 0.139$) and although the contribution is relatively small, it is significant, especially in the public sector, where governance and public performance influence the politics and economics of the public sector. The model fit (Table 6) output is statistically significant, $F(4, 210) = 9.669$, $p < 0.001$, so that it may be concluded that all practices of governance can be considered as determinants of perceptions of the success of a municipality.

Table 1: Model Summary

Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate
1	.394[a]	.156	.139	.71358

a. Predictors: (Constant), C34, B11, C27, C28

Table 6: Model Fit ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	19.693	4	4.923	9.669	.000[b]
	Residual	106.930	210	.509		
	Total	126.623	214			

Two predictors were significant. Budget responsiveness positively correlated with audit committee effectiveness ($b = 0.184$, $t = 2.037$, $p = 0.043$), meaning that audit committees were more effective when there were greater perceptions that the committees were responsive to community concerns. Additionally, there was a positive historical communication and transparency (C34) performance ($b = 0.175$, $t = 2.208$, $p = 0.028$), emphasising the role of the transparent government in properly aligning the budget with the needs of the community.

Risk-based auditing positively correlated, although not significantly ($b = 0.146$, $p = 0.121$), which meant that there were some poorly implemented or weak risk-based audits across the municipalities. Also, the effect of the internal audit assessments was negative and not significant ($b = -0.034$, $p = 0.733$), which meant that the internal audit was not able to improve the performance of the municipality in the audits. The regression analysis indicates that audit committees and communication are the most important predictors of good governance and the key drivers of responsiveness and accountability in the municipalities.

Qualitative Findings

For this part of the study, the researcher conducted 45 semi-structured interviews with managers, council members, and technical staff from the four municipalities of Ehlanzeni District. The interviews were centred on the nature of corporate governance, risk management, and accountability of the municipalities from the interviewees' points of view. The interviews generated six broad clusters concerning the day-to-day encounters of municipal practitioners on governance and risk management in their municipalities. Respondents were unanimous in defining governance as a set of systems and structures that work procedurally, the administration of governance frameworks being a question of reporting, auditing and financial compliance processes, and while all four municipalities had governance frameworks, respondents noted that the working environment is, in most cases, a governance framework in reverse. The interviews, therefore, reflect the intricate details of the governance and risk management frameworks as they fit in the daily routine administration of the municipalities. The findings have been organized thematically to reflect the repeated patterns of concern that arose from the interviews.

Theme 1: Duties and Governance Roles

Most participants explained their governance responsibilities in the context of financial administration, reporting, and compliance with the Municipal Act. Both senior and middle managers said their responsibilities mainly appropriate supervision of financial performance, report preparation for the audit committee, and supervision of the administration of the municipality in line with the Municipal Finance Management Act. These officers stated that a considerable amount of their time goes to the preparation and submission of quarterly compliance reports as well as the settlement of audit queries. Other participants, mainly Councillors, stated that their roles relate more to the representation of the community and the oversight of the administration of the municipality. In practice, most discussions about governance are centred on budgeting and auditing to the exclusion of planning and governance. Several participants indicated that for these reasons, the governance activities are often centred on procedural compliance without enhancing the performance of the institution. This pattern indicates that, in municipal settings, corporate governance tends to be more about compliance than strategic planning, active management of risks, and flexible controls. A senior manager in Bushbuckridge vividly articulated this phenomenon, referring to the repetitive nature of governance work:

"I oversee compliance with municipal financial legislation and make sure we report quarterly to the audit committee." – Senior Manager, Bushbuckridge.

Theme 2: Risk Situations Encountered

Participants described multiple types of risks that affect municipality processes and service delivery. Most frequently mentioned were operational risks, which include project delays, problems with communication between departments, and service coordination. Respondents raised the issues of fraud and financial mismanagement, including irregular spending, fraud in procurement, and non-compliance with the audit recommendations provided by the Auditor General. Some of the councillors mentioned that financial mismanagement could pose a reputational risk for municipalities since there are audit reports that highlight governance failures, which are accompanied by poor audit reports. Councillors mentioned that there is a risk of loss of transparency and accountability due to political interference in the control and procurement processes. Some participants mentioned that there are technological risks associated with the loss of municipal systems and data. They also said that the risk to municipalities is primarily non-financial and relates to operational, technological, and reputational risks. Nkomazi councillor described the way in which financial mismanagement can lead to a governance crisis:

"The municipality once faced a reputational crisis when funds were misappropriated, and the AG report flagged it." – Ward Councillor, Nkomazi.

Theme 3: Risk Management Processes

Several senior managers said there are formal systems of risk management within their municipalities. These systems encompass risk registers, quarterly risk assessments, reviews of internal auditing, and processes for monitoring compliance. However, interviews show that knowledge of these mechanisms is inconsistent across the levels of organisation. Senior officials tend to know the risk management tools and processes, while junior staff and some councillors reported little engagement in risk management formal discussions. This indicates that risk management is predominantly an upper administrative task rather than a responsibility that is distributed throughout the entire organisation. Several respondents mentioned that risk registers are usually

reviewed and updated just to satisfy reporting demands, and are not used to inform operational decisions. This is why risk management is often viewed as being inactive and not integrated into the daily service delivery tasks. Thus, the participants viewed the municipal risk management system as being operational, but not operational in the sense that it is not fully integrated into the organisation's practices. A finance officer from Mbombela explained how the municipal risk register is maintained:
"We use a risk register that is updated quarterly, guided by the MFMA framework." – Finance Officer, Mbombela.

Theme 4: Role Allocation and Accountability
Another big theme from the interviews has to do with the delegation of risk management and the associated accountability. Participants noted that the directorates usually have risk champions who identify risks and develop countermeasures. In theory, these frameworks are supposed to have all the risk management responsibilities divided and assigned among the municipal departments. However, participants claimed that the effectiveness of such frameworks is dependent on the department. While some directorates take risks seriously and do their risk assessments and trainings regularly, others see risk management as just another administrative process and not a management one. Participants have also noted that the accountability frameworks have sometimes been undermined by the lack of accountability mechanisms. In some instances, risk reports have been compiled, but no actions have been taken to address them, or actions have been taken, but they are delayed. Many participants have argued that accountability and training should be focused on more to improve the situation regarding these governance frameworks. Thaba Chweu's risk officer elaborated on how the municipality formally allocates risk responsibilities:
"Each directorate is required to allocate a risk champion and provide mitigation plans." – Risk Officer, Thaba Chweu.

Theme 5: Stakeholder and Community Involvement
There were also interview results showing the difficulties that participants in the community and stakeholders have. As they were indicated, the participants have reported that there exist formal mechanisms for community participation, mostly the Integrated Development Plan and community consultation forums. Many participants felt these mechanisms were more procedural than substantive. Community participation often takes place after there are delivery service gaps, not before, in the planning of the municipal programmes. A few councillors noted that constituents are more likely to voice their concerns through protests than to engage in the governance structures. Participants felt that there are gaps in the ways municipalities use the available technologies to communicate and interact with the people. Consequently, the municipalities and the communities they serve have broken and passive communication. The stakeholder engagement in municipalities rests on inadequate feedback mechanisms and incomplete planning. A councillor from Bushbuckridge explained this cycle of passive participation as follows:
"The public is rarely involved in actual planning; they only protest after poor outcomes." – Councillor, Bushbuckridge.

Theme 6: Audit and Oversight Functionality
The last theme has to do with oversight institutions in the local government structures. Most of the participants appreciate the contribution of the Auditor-General and municipal audit committees as the main oversight structures in the accountability process. These institutions should examine financial statements, assess compliance with laws, and give suggestions to better control document governance. Most respondents appreciate the importance of these structures, but also express concern over the low level of compliance with the recommendations of the auditors. Participants noted that municipal leaders receive audit recommendations, but recommendations are seldom implemented within an acceptable time frame. Some interviewees attributed this problem to politics, inadequate administration, and competing priorities within the organisation. There were differences noted between the local governments in the district. Participants noted that the City of Mbombela is generally more responsive to audit recommendations than other local governments in the district. This responsiveness is more of a reflection of the organisational culture. One of the middle managers in Nkomazi captured the sentiment that most local governments are facing in relation to the audit recommendations:
"Audit findings are tabled, but many are not acted upon effectively due to political interference." – Middle Manager, Nkomazi

Discussion

This study exemplifies that even though there are elements of corporate governance in place for the Ehlanzeni District municipalities, the effectiveness of corporate governance with regard to risk management is of an insubstantial nature. From our study, we were able to assess the governance elements in the community departments, such as the audit committee, internal audit unit, and risk register. However, the concern with these elements is the everyday, almost routine use, and not so much the conceptual use, which means these elements won't help in fostering the much-needed proactive risk management and organizational learning. Research on public sector governance elaborates on the same tendency where organizations in corporate governance structures are used as a means for compliance and not for improvement (Grossi & Argento, 2022). According to Bouckaert (2023), it is public organizations that are subjected to the greatest degree of formal governance and the least amount of control in terms of discretion over the management of operations. The local municipalities in South Africa show that governance frameworks such as King IV and the MFMA are insufficient in the delivery of services.

According to Mamokhere (2024), numerous municipalities still struggle with streamlining the governance frameworks within their administrative practices. Regarding the Ehlanzeni District, it appears that the problem is not the absence of governance structures, but the absence of their pervasiveness within the everyday integrated frameworks, decision-making, and risk management. The results from this study outline the impact of audit committees and the mechanisms of transparency, and how these influence perceptions regarding municipality performance. Regression analysis concluded that an increase in audit committees and stakeholder engagement correlates with positive perceptions regarding the responsiveness of municipal budgets to community priorities. This has been echoed with case studies on the governance and accountability paradox, and the influence oversight entities have on the public financial management (Anačkov, 2024). The theory of corporate governance and accountability argues that open access and transparent systems of information create trust in an organization, as stakeholders can track the expenditure of government funds (Al-Faryan, 2024). It has been established that public sector governance is more effective in municipalities that have more systems of accountability compared to those that less systems of accountability, as municipal service delivery and financial compliance are more robust (Bracci et al., 2021). In this study, municipal employees reported that departments with active audit committees and reporting systems integrated financial planning and service delivery priorities. This demonstrates the critical role oversight mechanisms play in advancing municipal governance. The evidence shows that transparency and stakeholder engagement from municipalities is truly in the spirit of democratic community engagement rather than the mere formality of doing the bare minimum.

While some positive correlations exist between the variables, the regression analysis indicates that governance variables explain only a small portion of the municipality's perceived performance, with the model accounting for just 15.6% of the variation. The model explained only 15.6% of the performance outcome variation. Other political and institutional variables are perhaps more important in explaining the efficacy of governance. The most important conclusion, perhaps, is the extremely limited impact of internal auditing on municipality performance. Survey and interview participants refer to the same scenario, wherein municipal management does not implement or act on internal audit recommendations. In the same breath, Efunniyi et al. (2024) found the same in the study of governance in the public sector, whereby internal auditing is ineffective because leadership ignores audit recommendations meant to foster organizational learning. Stewardship theory describes such situations, especially in public administration, where compliance and control levers are bogged down in the moral fibres of leadership (Steinfeld, 2023) to promote the public good. In the absence of committed leadership, governance control is more of a formality than a catalyst for change.

Studies regarding local government in South Africa have shown similar patterns in the annual reports that are consistently generated but changes in the reports remain inconsistent (Maphangwa et al., 2024). This shows that in the Ehlanzeni municipalities, internal auditing functions more as a system of controls rather than an initiator of change. Employees in various divisions sometimes perceive things differently, but they also capture some of the inner workings of city management. Statistical data show that professional staff and employees holding postgraduate degrees were more negative than their peers in administrative roles about the efficiency of management. Interviews reveal that these employees possess more knowledge about the rules, finances, and audits, and their training helps them to identify more shortcomings in the formal governance and in actuality. For agency theory, those near to the information flows within an organization are more prone to spot

deficiencies in governance and inefficiencies (Al-Faryan, 2024). Additionally, public administration studies show that the combination of professional competence and technical expertise shapes employees' perceptions about an organisation's governance (Krpálek et al., 2021). In the Ehlanzeni municipalities, staff members who have spent many years in the organisation stated that perennial institutional problems, such as unaddressed audit recommendations and lack of feedback, have persisted through multiple administrative cycles. This indicates that municipal organizations possess understanding and skills that can improve their governance frameworks, but this understanding is insufficiently integrated into the organization's governance.

The qualitative data show that municipal governance activities are primarily focused on regulatory reporting obligations, rather than dealing with risks proactively. Nearly all respondents described governance activities as document-heavy compliance, answering complaints, and balance sheet preparation. These activities, although they are legally required, do not help to identify and mitigate operational risks promptly. Compiling the literature on the intersection of public administration and risk management, some researchers note that public organizations tend to cultivate "learning-light" cultures, where compliance with risk and risk registers is used, but not in an active, robust, purposeful, and strategic manner (Gavurova et al., 2022). In the comparative studies of municipal governance, risk management integrated with planning and management of service delivery is ineffective (Sippola et al., 2023). In the municipalities of the Ehlanzeni District, interviewees said that planning is done in departments and risk registers are only reviewed in a way that risks are only identified after there are problems in service delivery. This situation shows that the municipalities are still mainly on reactive risk governance, with little room for proactive risk governance.

Most concerning is the absence of community stakeholders and employees in most processes of governance. Young employees and councillors are not seen in any formal conversations about the management of risks. This creates a gap with regard to the knowledge and information concerning the municipality's changes and developments. Participative governance research suggests that inclusiveness in decision-making leads to increased accountability of institutions and the overall enhancement of the delivery of services by the public sector (Ahmad & Islam, 2024). In South Africa, the increased participation of citizens, in the South African context, is associated with growing trust in the municipality's governance (Msenge & Nzewi, 2021). The current findings indicate that participation of the community in the municipalities of Ehlanzeni is mostly restricted to the formal Integrated Development Plan meetings. A number of the study participants in this research expressed that these meetings are procedural and not deliberative. The Stakeholder's theory argues that meaningful engagement rests on the continuity of interaction between public authorities and the citizens (Mandiriza & Fourie, 2023). In the absence of such interaction, the citizenry is left with no option but to use informal means, such as protests, to express their frustrations. The responses given by participants depict a desperate call for the municipality to widen the approach taken in participatory governance concerning the management of risks.

The change in political environment is another factor that influences governance practices. Some of the interviewees mentioned that there has been political interference that has caused delays in a number of activities, including the implementation of audit findings or the disciplining of the auditor. Such dynamics result in a loss of accountability, and the governance decisions that are made are a result of political factors and not of governance frameworks. Many scholars of public administration have pointed out that these political-administrative tensions are perhaps the most evident of the numerous constraints to the provisioning of local government services (Thusi et al., 2023). According to agency theory, political interference disturbs the balance of command and control over managerial discretion with respect to public sector institutions (Rubin, 2021). At the same time, political actors are meant to be trustees of the public resources and advocate for the public interest. When these functions are ignored, the governance systems become dysfunctional.

The study shows that the political meddling in governance systems may not entirely dismantle the systems, but may weaken systems by reducing the amount of effort, reluctance, and the enthusiasm that the personnel have in the enforcement of accountability. Analyses of both the qualitative and quantitative data streams described the dimensions of corporate governance in the Ehlanzeni District municipalities. The statistical study reflects the role of public perceptions of the performance of the municipalities of the Ehlanzeni District. The qualitative study highlights the governance frameworks and structures within the institution that shape the dynamics of governance. This aligns with the concept found in governance network studies, which emphasize

that the performance of public sector organizations is influenced by the interaction of institutional, organizational, and political factors. The same idea in the writings of governance network studies reflects that the performance of the public sector is a result of the fusion of institutional, organizational, and political structures (Klijn et al., 2025). The current findings suggest that the governance mechanisms work best when they are fused with other institutional arrangements. In municipalities, combining transparency, oversight, and participatory mechanisms provides better control over financial and operational risks compared to fragmented or politically influenced mechanisms.

In Ehlanzeni District, it appears that municipalities have structures necessary for effective corporate governance, namely governance frameworks, audit committees, and systems for managing risk, but these municipalities have yet to embed these systems into the culture of their administration. It appears that the passing of these frameworks is done without the requisite political will, organizational commitment, or constituent engagement. This is the position of authors of local government reform literature, and they cite local governance, public sector reforms, and internal organizational culture (Zeemering, 2021). The same feelings have been noted in corporate governance literature. Here, authors advocate for the need to supplement the implementation of governance frameworks with the requisite organizational culture and accountability structures (Diamantis, 2020). For the municipalities in Ehlanzeni District, the need to improve this focus is, more than anything else, the need to improve risk management and restore the trust of the citizens in the local government systems.

5. Conclusion and Recommendations

This research focused on corporate governance and municipal risk management in the Ehlanzeni District Municipality. It utilized primary data from a survey questionnaire, which collected quantitative data from 216 municipal officials, and qualitative data generated from semi-structured interviews with 45 participants. The results show that several municipal-governance frameworks exist, such as audit committees, internal audit units, risk registers and community participation forums. Their usage, however, is mostly compliance, political, and administration-driven. The frameworks are supposed to enhance accountability and service delivery, but the study confirms that the frameworks' impact on municipal performance is very limited. Notably, the study found that audit committees and an open, two-way communication system are key in ensuring that municipal budgets are aligned with the service delivery goals. Additionally, the community forums are the weakest in influencing the outcome of internal audits. Governance processes that are internalized in the day-to-day management of municipalities are mostly lacking.

The study helps show how some examples of corporate governance can help and influence risk management within local government. The study helps answer how and why corporate governance works in municipalities by using a combination of Agency, Stewardship, Stakeholder, and Institutional perspectives. The results suggest that the reason why governance sometimes works is because of the frameworks that exist. The results also suggest that it is the political and administrative officials who have to have a core to stick to, and that governance frameworks have to be worked on. Results from this study highlight the need to work on and address the capacity of governance, the level of operational transparency, and the depth of stakeholder inclusiveness at all levels of local government. Results from the study show that local government should be trusted in the management of governance frameworks and they should be able to respond to the risks management systems.

Recommendations

This study has shown ways to enhance corporate governance and risk management in the Ehlanzeni District Municipality through policy and administrative changes. Starting with the first recommendation, the internal audit units and the audit committees have to be bolstered so that they can be more than just units that watch compliance. They have to be seen as units that are for the study of the organization and for the improvement of governance. Such changes will require clearer mandates, adequate funding, and political will to a greater degree. Audit recommendations should be continuously addressed within a defined timeframe, with progress reports regularly submitted to both the municipal councils and the public to ensure transparency and accountability.

Another suggestion could be that municipal departments, as a complete entity, attempt to contain risks through the collective risk management of each municipal directorate. Each directorate should document the actions taken for the recognition and containment of the risk. Accordingly, each directorate should identify risk champions for each unit of the directorate to mentor and assist the unit in the effective fulfilment of these functions. Mostly, risk management is elementary and aims at increasing the use of risk registers, and this will flow down to the plans and the standard of decisions taken.

Municipalities can enhance communication systems by streamlining access to municipal budgets, governance reports, and service delivery reports. When information is readily accessible, community accountability and transparency are increased. Digital means and public information dashboards can further enhance these factors. Subsequently, municipalities will be able to better respond to and incorporate community feedback, improving service delivery.

Stakeholder participation is instrumental to capturing community needs and wants to incorporate into governance and risk management processes. For the Integrated Development Plan, community forums and consultations must be synchronized with municipal planning and budgeting cycles. When municipalities enhance the quality of participation for citizens and civic organizations, community relationships are strengthened, trust is cultivated, and local governance systems' responsiveness is increased.

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The Mediating Effect of Employee Engagement on the Relationship Between Talent Management Practices and the Performance of MDAs in Uganda

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Abstract: The study aimed to investigate the role of Employee Engagement as a mediator variable between Talent Management Practices and the performance of Ministries, Departments, and Agencies in Uganda. The study used a quantitative study approach based on the Person-Job Fit Theory by Edwards (1991) and the Social Exchange Theory by Homans (1958). The study used a sample of 103 Ministries, Departments, and Agencies out of which 93 responses were obtained, representing 90 percent of the total population. The study used a cross-sectional study approach and ordinary least squares regression analysis based on the Baron and Kenny (1986) approach for mediation effects. The study established that Talent Management Practices have a positive and significant direct effect on MDA performance ($\beta = .545$, $p < .001$) and also have a significant effect on Employee Engagement ($\beta = .440$, $p < .001$). Furthermore, the study established that Employee Engagement has a strong predictive effect on MDA performance ($\beta = .595$, $p < .001$). However, when both variables are used, the study established that Talent Management Practice's direct effect on MDA performance was reduced to $\beta = .352$ ($p < .001$), whereas Employee Engagement was still significant ($\beta = .440$, $p < .001$). The indirect effect via Employee Engagement explained about 48 percent of the total effect, while the model explained 45.4 percent of the variation in MDA performance, $R^2 = .454$, $N = 95$. The results indicate that Talent Management Practices have a positive impact on MDA performance, both directly and indirectly via Employee Engagement, which is a critical mediator linking Talent Management Practices to MDA performance. The study recommends that MDAs in Uganda adopt a holistic and merit-based approach to talent management, employee engagement should be a strategic imperative, transformational leadership at the supervisory level should be enhanced, and supportive organizational environments should be developed to allow the returns from talent management to lead to consistent improvements in service delivery, accountability, and overall institutional effectiveness in Uganda's public sector.

Keywords: *Talent Management Practices, Employee Engagement, Performance of MDAs, Partial Mediation, Uganda*

1. Background

Globally, the performance of Ministries, Departments and Agencies has been affected by how they manage the available talent, and some UN agencies have stood out in applying deliberate talent management that boosts their internal performance (Mkamburi and Kamaara, 2017). Institutions that invest in systematic development, succession planning and employee active engagement are also likely to report higher productivity and better service delivery (Abdullahi, Raman and Solarin, 2022). Even in times of crisis such as the COVID-19 pandemic, organizations that sustained employees' engagement and knowledge sharing managed to buffer the performance decline, with higher resilience than those that did not (Ahmed et al., 2020). Moreover, where organizations link talent strategies with retention and engagement, they manage to sustain performance through retaining skilled workers' motivation and commitment (Chopra, Sahoo and Patel, 2024). This has explained that talent management aligned with career development and continuous learning drives better performance outcomes globally (Al Aina and Atan, 2020).

In Africa, the performance of MDAs has been mixed, with some institutions performing better by embracing talent management and employee engagement while others continue to grapple with high employee turnover and low morale that undermine service delivery (Barkhuizen and Gumede, 2021). There is evidence that organizations that connect performance management and employee engagement are more likely to report productivity and accountability, placing them ahead of their counterparts that do not (Govender and Bussin, 2020). State-owned enterprises and public utilities have also demonstrated that employee engagement has a direct influence on task performance, even though more overarching issues, such as poor resources and absence of managerial support, still maintain the majority of them in the low to medium scale of performance

(Ohemeng, Obuobisa Darko, and Amoako-Asiedu, 2020). Where managers provide development opportunities and ease the sharing of knowledge, the agencies record apparent improvements in service delivery, showing that engagement can enhance performance even when the environment is difficult (Kravariti, Tasoulis, Scullion and Alali, 2023). Frontline service organization research also proves that engaged employees result in customer-oriented behaviors that reflect on overall organizational performance (Ghlichlee and Bayat, 2021).

In Uganda, MDAs' performance has remained uneven, with some examples of good practice but most still bogged down by bureaucracy, limited career development opportunities and frail systems that reduce staff morale and productivity (Nachonga, Matagi and Emuron, 2021). Where talent management and engagement have been intentionally implemented, for example, through succession planning and better managerial support, some improvements have been recorded in employee performance and service delivery (Obedgiu, Lagat and Sang, 2022). Also, studies in public universities show that motivation and engagement positively affect work performance, yet the lack of standard talent practices within government agencies makes most MDAs perform below the standard that has been witnessed in the world (Otyola, Julie, Caro and Rogers, 2023). This is explained by the Person-Job Fit Theory by showing that when employees are placed where they lack the necessary skills, performance suffers unless recruitment and placement are improved (Mensah and Bawole, 2020). Social Exchange Theory also argues that without fairness, gratitude and support from management, even workers who are good fits for their positions may disengage, and this is something Ugandan MDAs need to address through stronger HR practices and empathetic leadership (Ahmad, Nawaz, Ishaq, Khan and Ashraf, 2023).

2. Literature Review

Theoretical Literature Review

The study is guided by the Person-Job Fit Theory by Edwards (1991), which states that employees are improved performers and most loyal when their competencies, skills, and orientations are well matched with what the positions demand (Edwards, 1991). It has been established through research that when such compatibility exists, employees are more efficient and likely to work, as demonstrated in the research of Aydin Kucuk (2022), which found that job fit enhances workflow experiences via supportive leadership relationships. Bui, Zeng and Higgs (2017) also supported that person-job fit increases transformational leadership's relationship with employee engagement, while Memon, Salleh and Baharom (2015) further supplemented that it reduces turnover intentions by covering organizational alignment with engagement. Mensah and Bawole (2020) demonstrated that in parastatals, person-job fit serves as a significant mechanism through which talent management is to be translated into improved employee performance, and Zhu et al. (2018) emphasized that correct talent in the proper jobs eliminates role stress and maximizes performance. On the other hand, Social Exchange Theory, developed by Homans (1958), explains that working relationships operate on reciprocity, fairness, and mutuality (Ahmad, Nawaz, Ishaq, Khan and Ashraf, 2023). Studies proved that where there was perceived support and justice, there was a chance that employees would share knowledge and innovate in their actions, according to Arsawan, Wirga, Rajiani and Suryantini (2020). Meira and Hancer (2021) also showed that positive interactions strengthen the employee-organization relationship in service settings, and Xu, Wang and Ma (2022) found that reciprocal interactions stimulate citizenship behaviors beyond formal job requirements. Together, these theories suggest that Uganda's Ministries, Departments and Agencies' performance can be optimized when talent management practices not only put the right individual in the right position but also create fair and enabling transactions, which would lead to employees' involvement and commitment.

Talent Management Practices and Performance of MDAs

The effect of talent management practices on Ministries, Departments, and Agencies (MDAs) performance in Uganda has been under more scrutiny due to the significant role that these practices play in the performance of an organization. Al Aina and Atan (2020) examined talent management practices among UAE real estate companies and observed that not all practices equally affect sustainable performance. Their findings show that learning and development and career management activities drive organizational performance hugely, while talent attraction and retention contribute less. This means that employee development initiatives, acquiring skills, and mobility within the company are more successful than the classic recruitment and retention strategies. These conclusions are particularly pertinent to MDAs in Uganda because it is generally recognized that in the public sector, there is often a rigid structure, limited opportunities for career progression, and wasted

human potential. If MDAs were to target learning programs, training, coaching, and job rotation as talent management approaches, it is clear that an effective workforce in terms of enhanced operational effectiveness and service delivery in the long term could be achieved. Further, it is critical to align talent management practice with general strategic and operation-related goals; that is, engage in employee development that has an immediate effect on organizational success and sustainability in the public sector. Meyers et al. (2020) studied the effect of HR managers' talent philosophies on talent management practices; in so doing, they were able to illustrate a multi-dimensional understanding of organizational beliefs and how these influence workforce approaches.

By categorizing four basic talent philosophies into exclusive/stable, exclusive/developable, inclusive/stable, and inclusive/developable, the study demonstrated the impact of HR managers' mental models on inclusiveness and differentiation of talent management. Not surprisingly, while the talent philosophies have been seen to impact workforce engagement and TM strategy in later stages, they have had little impact on talent identification criteria. The implications of MDAs in Uganda are quite significant, as managerial attitudes and leadership beliefs can have a direct impact on the success of talent management programs. The pursuit of inclusive and developable philosophies can lead to greater employee engagement and fairness in employee growth and development, creating a fertile ground for the development of talent at all organizational levels. This has synergies with public sector goals by focusing on sustained human capital building, turnover reduction, and organizational power in a system that is typically characterized by political stresses and bureaucratic ineffectiveness, undermining the effectiveness of conventional talent management approaches. Atwood (2025) provides a case study of talent management in a high-risk and highly hierarchical organization in the US Navy acquisition workforce.

The study was instrumental in proving that by reshaping talent identification, recruitment, development, and management practices, the Navy was in a position to enhance accountability and responsiveness in its management processes to enable managers to make prompt decisions and incorporate innovation. In MDAs in Uganda, which are normally characterized by inflexibility in management processes and decision-making, the implications of the findings of Atwood's study necessitate the realignment of talent management processes to ensure agility in leadership processes and innovation. Imitating the strategies will enable MDAs to develop a responsive workforce that can address emerging problems and maximize the delivery of services to enhance public sector performance. In addition, Atwood's findings also imply the applicability of selective talent development strategies and mentoring programs. This implies that MDAs can benefit from developing strategies to identify high-performing employees and equipping them with the skills and authorities to enhance organizational performance. Barkhuizen and Gumede (2021) also explored the relationship between talent management and job satisfaction and voluntary turnover in a government agency in South Africa.

The study established that talent development, performance management, retention, and compensation were all very low, resulting in low levels of job satisfaction and high turnover intentions. In addition, a vast majority of employees were contemplating leaving their jobs. In this regard, Kravariti et al. (2023) cited the need to consider line manager support and organizational development as mediating the effect of talent management on performance, highlighting the need for robust support structures to achieve the benefits of TM programs. In another study by Obedgiu, Lagat, and Sang (2022), the study established that transformational leadership had a strong positive effect on TM-worker performance interaction in public universities in Uganda. This study, therefore, highlights the need for leadership to motivate workers to perform. All these studies, therefore, show that when talent management practice is implemented in public institutions like Uganda's MDAs, its effectiveness will depend on participation, support from line managers, and organizational culture. By ensuring effective managerial support and linking TM to workers' motivation and job satisfaction, the MDAs are in a position to facilitate workers' performance and, by extension, public service delivery. By and large, these studies suggest that by and large, while TM practices constitute the building blocks to improved performance, connecting leadership, engagement, and organizational support is what makes them operational realities.

The Relationship Between Employee Engagement and The Performance of MDAs

The linkage of employee engagement and Ministries, Departments, and Agencies (MDAs) performance in Uganda is significant to the development of public sector organizations to leverage human capital for more efficiency and accountability. Employee commitment, defined as psychological and emotional involvement

expressed by employees towards work and the organization, has been widely linked to productivity, motivation, and work quality (Tensay & Singh, 2020; Zondo, 2020). More motivated employees have higher commitment, influencing individual and organizational performance in the quality of work, fewer absences, and better services (Ahmed et al., 2020). Participation is more important to MDAs because public organizations are typically constrained by bureaucratic systems, tight budgets, and severe accountability mechanisms that might undermine motivation and performance (Ohemeng, Obuobisa Darko, & Amoako-Asiedu, 2020). Tensay and Singh (2020) established that HRM practices enhance participation that mediates organizational performance using the AMO and Social Exchange Theory models. Ahmed et al. (2020) also demonstrated that engagement, in combination with knowledge sharing, enhances crisis performance during a crisis such as the COVID-19 pandemic, with adaptive responses being emphasized as the required response. The focus of tertiary learning limits direct applicability to Uganda's MDAs, where service demand and operational concerns are extremely diverse. All these studies refer to the contribution of engagement as a performance driver but point to the need to situate this within Uganda's peculiar public sector context, due to bureaucratic and political considerations. Leadership, employee engagement, organizational culture, and technology infrastructure are key drivers of employee engagement, and MDAs in Uganda can learn from them.

Heslina and Syahruni (2021) noted that IT infrastructure, HR capability, and engagement are interdependent of performance in Indonesia's Makassar Regional Revenue Agency, an instance of the role played by technology and effective HR systems to enable workers to perform effectively. Liu et al. (2022) further noted that empowerment, effective leadership, and a collaboration-oriented culture have strong impacts on engagement, moderated by an innovation culture between engagement and performance. Boccoli, Gastaldi, and Corso (2023) further developed the engagement concept by situating it as a dynamic, socially relational construct particularly useful in distributed and hybrid work environments. Govender and Bussin (2020) highlighted the managerial communication and performance management key roles influencing engagement, with disempowerment and confusion reducing the effect of engagement. These studies collectively show that although technical and structural assistance are crucial, leadership and management reaction are also crucial in translating participation to measurable performance. For the MDAs of Uganda, therefore, both synergy of supportive systems and strong leadership are crucial in overcoming bureaucratic stiffness, resource inadequacy, and uneven managerial conduct in translating participation to superior organizational performance. Certain research points out the mediating and contextual factors that decide the impact on performance of engagement, and with it, uncover issues specific to public sector organizations.

Zondo (2020) demonstrated that engagement in itself would not necessarily drive productivity but may have an indirect influence on performance by reducing absenteeism, and accordingly, reinforcing mechanisms are needed. Nguyen and Nguyen (2023) found that job attractiveness positively influences engagement and performance, but not that engagement will necessarily result in enhanced performance, showing the organizational climate and image. Ghlichlee and Bayat (2021) investigated the mediating mechanism of customer-centric behaviors where perceived employee engagement serves to better deliver outcomes of service through enhanced interaction and responsiveness. In contrast to other research, these findings imply that the engagement effect is differential by organizational context, attitudes among employees, and complementary factors such as leadership, reward schemes, and role clarity. For Uganda MDAs, the findings imply that engagement initiatives need to be complemented with performance management, citizen orientation in delivering services, and working environments that enable actual efficiency gains, accountability, and service delivery outputs. While a lot of research has been done, spaces of employee engagement in Uganda's MDAs are vast and therefore context-based studies are called for.

Nachonga, Matagi, and Emuron (2021) and Otyola et al. (2023) provide insight into engagement and performance in the context of higher learning, but MDAs operate in varied contexts defined by bureaucratic institutions, constraints in resources, and surveillance through politics, which can alter the nexus of engagement and performance. Adhitama and Riyanto (2020) validated the use of adaptive engagement strategies in times of crisis, such as the COVID-19 pandemic, by emphasizing the need to prioritize workers' health as well as productivity. Ohemeng, Obuobisa Darko, and Amoako-Asiedu (2020) also indicate the need for a feeling of awareness of how engagement affects task performance by public sector agencies in developing nations to facilitate effective policies to be formulated. Together, these studies suggest that MDA's involvement should be addressed multidimensionally via the convergence of HR practices, leadership, IT systems, and

motivational mechanisms to flip performance. This knowledge gap is likely to be filled to develop accurate strategies to increase employees' commitment, decrease turnover, and improve service quality in Uganda's public sector based on aligning engagement measures with the unique operating, socio-economic, and political environments of MDAs.

The Mediating Effect of Employee Engagement

The relationship between talent management practice and performance has been extensively examined using the shared agenda of exploring the mediating role of employee engagement. Yuniati et al. (2021) researched Indonesian midwives and found that talent management in itself was not sufficient to affect organizational performance, concluding that engagement translated recruitment, development, and retention efforts into enhanced performance. Likewise, Khairina and Games (2022) also carried out research among bank employees and established that engagement mediated the effects of talent management to a greater extent, while job satisfaction mediated to a smaller extent. Abdullahi et al. (2022) evidenced empirically in Malaysian private universities that engagement partially mediated the effects of training, development, and compensation on performance, while talent recruitment influenced it directly, revealing the fact that the mediating effect of engagement varies depending on the talent management practice type. Sumarto and Rumaningsih (2021) also demonstrated in Indonesia's Social Security Administration that participation served as a mediator for the indirect effects of knowledge management and talent on employee performance, demonstrating the way participative employees utilize organizational resources more effectively. All the studies establish that engagement is among the most vital mechanisms through which talent management exerts its influence, but the level of mediation depends on organizational environment, sector, and intervention type.

Additional research builds on these findings by examining allied mechanisms and industries. Chopra et al. (2024) examined the mediating effect of engagement in the employer branding-employee retention relationship within the IT industry, predicting that engagement could influence increased performance indirectly through commitment and retention. Hakro et al. (2022) studied Malaysian universities and posited succession planning, promotion, and performance appraisal to influence performance indirectly through the mediation of engagement, further establishing its position as a driver of talent management effectiveness. In comparison to the above research, one observable trend is that where direct effects of talent management on performance are displayed, engagement always supports and sustains these effects in all sectors. However, the bulk of the work has been done in private or near-public institutions, and hence not much is known about how these dynamics occur in Uganda's Ministries, Departments, and Agencies, where low morale, lack of resources, and bureaucracy are the order of the day. Combining these studies, it can be understood that talent management initiatives need to incorporate engagement-oriented initiatives like career development, rewards, and ease of working conditions to be able to translate investments into tangible improvements in performance, especially within public sector environments where motivation and resource paucity can hijack results.

Additionally, research still indicates that the success of talent management programs in determining employees' performance depends largely on the experience of high employee engagement. Ekhsan, Parashakti, and Perkasa (2023) demonstrated that in Indonesian manufacturing firms, engaged employees were likely to push talent management programs toward the enhancement of performance, thus showing that employee engagement optimizes the positive effect of hiring, training, and development. The same results were observed by Hussain et al. (2024) in the banking industry of Pakistan, where employee engagement acted as a mediator between talent management and organizational commitment, but with partial mediation, establishing the fact that engagement increases the commitment of employees towards organizational objectives. Riyanto, Endri, and Herlisha (2021) corroborated in the IT sector that motivation and job satisfaction, along with engagement, exercised a significant influence on performance outcomes, as they demonstrated that engagement is an important medium for motivational determinants to have an effect on outcomes. This was echoed by Ateeq (2023), demonstrating in Bahraini retail firms that engagement mediated the equal opportunity practices-employee performance relationship, depicting the combined importance of fairness and engagement in influencing outcomes. Abdullahi, Raman, and Solarin (2022) also confirmed that succession planning in Malaysian universities improved performance through the involvement of staff, adding that in-house development opportunities in a formal structure create motivation as much as output. Goestjahjanti et al. (2020) also demonstrated how talent management in the automotive industry strengthened job satisfaction

through engagement, whereas leadership alone was less effective, emphasizing that engagement is the most important mechanism by which organizational programs are connected to intended employee outcomes.

These findings collectively indicate that employee engagement is not a random variable but a central mediator of the effectiveness of talent management practices in industries and contexts. Synoptic comparison of the studies indicates that engagement strengthens the impact of talent management on performance, commitment, and satisfaction, whether in manufacturing, banking, IT, retail, education, or automobile industries. The study also illustrates that the nature of talent management practice, be it recruitment, development, succession, or equal opportunity, interacts with engagement in differing ways, the implication being that organizations will need to tailor their interventions individually to maximize their effects. Most significantly, much of the research is focused on semi-public or private organizations, and hence, there is a very large knowledge gap on how these processes emerge in Uganda's Ministries, Departments, and Agencies, where bureaucratic processes, limited resources, and low motivation can reverse engagement. To put these findings into practice for the Ugandan MDAs to improve performance, it is through connecting talent management with strategic engagement practices, like career development, rewards, good working conditions, and equity-generating policies, in a way that investments in talent are converted into lasting gains in performance and improved delivery of public services.

3. Methodology

The research was based on a positivist research PARADIGM that suggests that social factors such as talent management practices, employee engagement, and performance can be quantified and tested through statistical analysis (Creswell, 2014; Saunders, Lewis & Thornhill, 2019). This research philosophy is appropriate for research studies that aim to test relationships and mediation effects through structured tools and quantitative data (Bryman & Bell, 2015). In line with this research philosophy and approach, this study employed a quantitative research approach to investigate how employee engagement acts as a mediator for the relationship between talent management practices and the performance of MDAs in Uganda.

A cross-sectional survey design was used to gather data from MDAs at one specific point in time, and this enabled the study to evaluate relationships between variables within their real-life setting (Bryman & Bell, 2015). The population of interest to this study comprised 146 MDAs in Uganda. The MDAs comprise ministries, semi-autonomous agencies, and other departments within the government (Ministry of Public Service, 2023). According to Krejcie and Morgan (1970), a sample of 103 MDAs was used to represent the population. This was done through proportionate stratified sampling and then simple random sampling. Data was collected through structured self-administered questionnaires targeting senior executives, departmental heads, and human resource managers within MDAs because these individuals are directly involved in talent management, employee engagement, and performance management within MDAs.

For the analysis of the data, SPSS was used following the steps of Baron and Kenny (1986) in testing mediation. These steps involve conducting an ordinary least squares regression test to examine the direct relationship between talent management practices and MDA performance. Regression analysis was also conducted to examine the relationship between talent management practices and employee engagement. Additionally, regression analysis was used to examine the relationship between employee engagement and MDA performance to ascertain its independent relationship. Further, regression analysis was conducted including talent management practices and employee engagement to ascertain the mediating effect of employee engagement in the relationship between talent management practices and MDA performance by confirming the reduction of the relationship between talent management practices and MDA performance. Further, Pearson correlation analysis was used to ascertain the nature of the relationship between variables before conducting regression analysis as suggested by Gujarati & Porter (2009).

To improve the quality of the study, common method bias was managed by using various methods such as ensuring anonymity of the respondents, making questions clear and simple, as well as separating scales of measurements, as indicated by Podsakoff et al. (2003). The validity of the study was ensured by checking it among experts; in addition, convergent validity was used to test construct validity, as indicated by Hair et al. (2019). Reliability was examined using alpha reliability test values above 0.70 as acceptable by Nunnally &

Bernstein (1994). This study ensured that the results of the mediating effect of employee engagement in the relationship between talent management practices and MDA performance in Uganda were objective, reliable, and generalizable.

4. Findings

Out of the 103 MDAs that were sampled in this study, it was able to achieve a 90% response rate. This means that there were 93 valid responses. The descriptive study indicates that there is a good number of these MDAs that have been in operation for quite some time. For example, 41% of these MDAs have been in operation for more than 15 years. Additionally, 31% of these MDAs have been in operation for between 10 and 15 years. On the other hand, 20% of these MDAs had been in operation for 5 to 10 years. However, only 8% of these MDAs had been in operation for less than five years. Regarding funding, it is clear that most of these MDAs, 58%, depend mostly on government budget allocations. Others depend on donor funding, 18%, while 16% of these MDAs depend on government funding combined with internal revenue generated by these MDAs. Additionally, 8% of these MDAs depend mostly on their own internal revenue generated.

Looking at the location of these MDAs, it is evident that nearly half of them, that is, 45%, are located in the Central Region. This is followed by the Western Region, which has 26%. The Eastern Region has 16%. The Northern Region has the lowest number of MDAs located in the region, that is, 13%. If one looks at the way these MDAs operate, it is evident that the majority of them, that is, 64%, operate at the national level. This is followed by the ones operating regionally, which is 18%. The ones operating at the district level are 11%. The ones operating at the local level are only 7%. If one looks at the budget of these MDAs, it is evident that 35% of them operate on a budget of more than UGX 2 billion. This is followed by the ones operating on a budget of between UGX 1.5 and 2 billion. This accounts for 27%. The ones operating on a budget of between UGX 1 and 1.5 billion are 19%.

In terms of sector, more than half of the MDAs, 55%, belong to the service sector, while 30% are engaged in agriculture and natural resources, and 15% in industrial and infrastructure activities. In terms of their status, 60% are fully government-owned, 27% are semi-autonomous agencies, and 13% are run as parastatals. Overall, this mix in terms of age, funding, sector, and scope provides a fair and well-balanced view in terms of how employee engagement plays a role in talent management practices and performance.

Mediation of employee engagement between talent management practices and the performance of MDAs in Uganda

Mediation Results

Table 1 presents the regression results for the mediation of Employee Engagement in the relationship between Talent Management Practices and the Performance of MDAs in Uganda, tested following the four-step Baron and Kenny (1986) procedure.

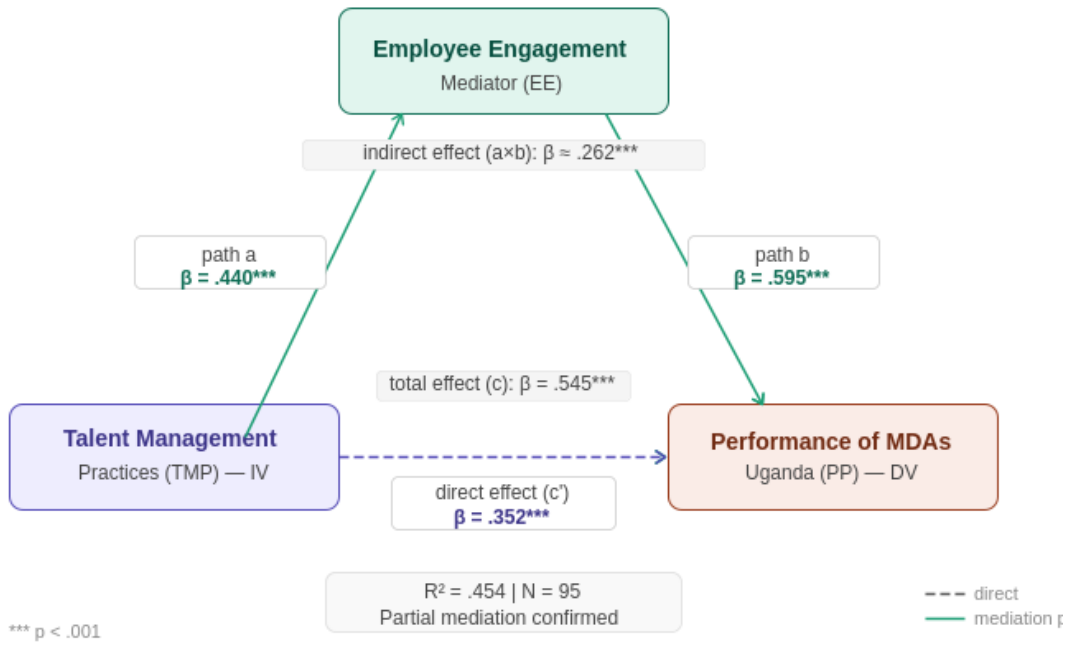
Table 1: Regression Results for Mediation of Employee Engagement between Talent Management Practices and the Performance of MDAs in Uganda

Steps	Regressions	B	SE	Beta	Sig.
IV & DV	TMP → PP (Performance of MDAs)				
	TMP → PP	.806	.057	.545	.000
IV & MV	TMP → EE (Employee Engagement)				
	TMP → EE	.418	.039	.440	.000
MV & DV	EE → PP (Performance of MDAs)				
	EE → PP	.927	.058	.595	.000
IV, MV & DV	TMP & EE → PP (simultaneous)				

Steps	Regressions	B	SE	Beta	Sig.
	EE → PP	.686	.059	.440	.000
	TMP → PP	.520	.056	.352	.000
Part correlations	EE = .395 TMP = .316				
R^2	.454				
N	95				

Source: Primary data, 2025

Figure 1: MedGraph Path Diagram for Mediation of Employee Engagement between Talent Management Practices and the Performance of MDAs in Uganda (Jose, 2013)



Source: MedGraph output (Jose, 2013); Primary data, 2025

Discussion

The results obtained in this study generally support the Person-Job Fit Theory (Edwards, 1991) and the Social Exchange Theory (Homans, 1958), and they are also in line with the general body of empirical literature on talent management and employee engagement in public sector organizations. The significant positive direct effect of Talent Management Practices on the Performance of MDAs in Uganda (.545, $p < .001$), along with the partial mediation role of Employee Engagement (.262), not only confirms that person-job fit does enhance organizational performance but also that the nature and quality of social and psychological exchange do enhance this effect.

The significant direct effect of Talent Management Practices on MDA Performance is strong empirical support for the proposition that investment in HR yields significant institutional returns before even accounting for engagement. This is consistent with Al Aina & Atan's (2020) study showing that learning and development activities, as well as career management activities, were significant influencers of organizational performance. Similarly, Atwood's (2025) study found that adaptive talent identification, empowerment, and development approaches significantly enhanced accountability and responsiveness in a hierarchical public institution. Additionally, Kravariti et al. (2023) found that talent management practices were effective in enhancing

organizational performance in public sector organizations where there was strong line manager and organizational support. These findings imply that in Uganda's MDAs, investment in integrated talent management practices such as talent recruitment, talent development, talent performance management, and talent succession directly translates to performance returns before even considering their contribution to staff morale.

The partial mediation effect of Employee Engagement is, however, the most theoretically significant of all. The indirect effect of Employee Engagement was found to be significant ($\beta \approx .262$, $p < .001$), explaining 48% of the total effect of Talent Management Practices on performance. This suggests that almost half of the performance returns obtained by investing in talent management practices can be explained by the psychological and behavioral effects of Employee Engagement. These findings align with those of Yuniati et al. (2021), who found that talent management practices were not enough to obtain organizational performance without the mediation effect of Employee Engagement. These findings also align with those of Khairina & Games (2022), who found that Employee Engagement was a stronger mediator of talent management practices than job satisfaction in mediating the relationship between talent management practices and performance among bank employees. Similarly, Abdullahi et al. (2022) found partial mediation in Malaysian private universities to establish that different dimensions of talent management practices engage the mediation effect to varying degrees. The convergent validity of these findings in different sectors is likely to increase confidence in Employee Engagement as an important rather than an ancillary correlate of organizational outcomes.

The fact that Talent Management Practices were a significant predictor of Employee Engagement ($\beta = .440$, $p < .001$) echoed the fundamental proposition of the Social Exchange Theory, which asserts that employees return organizational investment in the form of increased work efforts, loyalty, and commitment (Homans, 1958; Ahmad et al., 2023). Arsawan et al. (2020) supported the fact that employees who experience supportive and fair organizational climates were more likely to engage in sharing knowledge and innovating, while Meira & Hancer (2021) supported the fact that positive organizational interactions serve to enhance the employee-organization relationship in service contexts. In the Ugandan MDA organizational setting, which is characterized by bureaucratic rigidity, lack of career mobility, and variable management support (Nachonga, Matagi, & Emuron, 2021), the positive relationship between talent management practices and employee engagement indicated that HR investment facilitated the sense of reciprocity and fairness to offset disengagement forces. Obedgiu, Lagat, & Sang (2022) supported the consistency of this relationship in the Ugandan public universities, which indicated that transformational leadership strengthened the relationship between talent management performance and employee engagement, thereby reiterating the role of leadership as a driver of engagement.

The substantial influence of Employee Engagement on MDA Performance is evidenced by a Beta Value of .595 and is statistically significant at $p < .001$. This is also the highest Beta Value for this model and points to the substantial influence of Employee Engagement on MDA Performance. Tensay and Singh (2020) established, via AMO and Social Exchange Theory frameworks, that HRM practices boost levels of Employee Engagement, which in turn mediates organizational performance—a finding that is identical to this study's results. Ekhsan, Parashakti, and Perkasa (2023) established that engaged Employees amplify the influence of talent programs on organizational performance, while Riyanto, Endri, and Herlisha (2021) established that Employee Engagement channels Motivational Energy into organizational performance. The substantial influence of Employee Engagement on MDA Performance is especially important for Uganda's MDAs because it points to a situation whereby once Employee Engagement is triggered, substantial levels of organizational performance ensue, whereby even marginal increases in how engaged Employees feel towards their work and organization result in substantial increases in organizational performance. Goestjahjanti et al. (2020) established that Employee Engagement is more influential in mediating the influence of organizational programs on Employee Outcomes than leadership interventions.

The partial mediation result is noteworthy. It suggests that, while engagement is a key mediator, Talent Management Practices also have a substantial direct effect ($\beta = .352$, $p < .001$) on performance that is not mediated through engagement. This is similar to the Hakro et al. (2022) study, which found that succession planning, promotion, and performance management all have effects on performance that are partly mediated through engagement and partly through direct structural and procedural effects. Barkhuizen and Gumede

(2021) similarly found that low-quality talent management practices result in low job satisfaction and high turnover intentions, regardless of engagement levels. The direct effects speak to structural HR quality. For MDAs in Uganda, this partial mediation result suggests that managers face a dual imperative to enhance structural quality (merit-based staffing, development, and performance management) and to build psychological conditions for engagement (fairness, recognition, career clarity, and managerial support). One side of this equation without the other represents substantial unactualized potential for improved performance.

The overall model explains 45.4% of the variance in MDA performance (R^2 = .454), which is a strong explanatory model for organizational research, indicating that the role of talent management and employee engagement as a whole is a strong explanatory framework for MDA performance in the public sector of Uganda. The remainder of the variance can be explained by other factors outside the scope of this research, which include resource sufficiency, political interference, and technological infrastructure, as all of which have been identified by Heslina & Syahruni (2021), Govender & Bussin (2020) and Ohemeng, Obuobisa-Darko, & Amoako-Asiedu (2020), as contextual moderators that shape the relationship between engagement and performance. The above considerations highlight the need for a more holistic approach to the delivery of talent management and employee engagement interventions as a whole, in order for the full performance-generating potential of the two to be realized in the Ugandan public sector.

5. Recommendations

The MDAs in Uganda should adopt a holistic, evidence-based approach to talent management, including the entire employee lifecycle, with merit-based recruitment and competency profiling aligned to the Person-Job Fit Theory (Edwards, 1991), and moving beyond ad hoc training to include career management, coaching, job rotation, and succession-based approaches as recommended by Al Aina & Atan (2020) and Meyers et al. (2020). Employee engagement should also be taken to the next level, from being a secondary consideration for HR to a core organizational imperative, as its role as a mediator of approximately 48% of the total impact of talent management on organizational performance (Kreitner & Kinicki, 2018, p. 522) warrants its elevation to a strategic imperative by the organizational apex, with a working environment of fairness, mutuality, and openness, as recommended by the Social Exchange Theory (Homans, 1958), as supported by the findings of Arsawan et al. (2020) and Xu, Wang & Ma (2022). Line managers should also be developed as champions of talent management and employee engagement via specific intervention programs to enhance transformational, as opposed to merely transactional, management styles, as supported by the findings of Kravariti et al. (2023) and Obedgiu, Lagat & Sang (2022).

In conjunction with these human capital interventions, the MDAs must also develop formalized succession planning systems that recognize and develop future leaders early in their careers and establish transparent progression routes to the conditions of leadership that Hakro et al. (2022) and Abdullahi et al. (2022) demonstrate motivate and enhance performance through the engagement lens. Crucially, however, none of these interventions will achieve their maximum effect without the appropriate organizational enablers, and the Government of Uganda and the MDA leaders must also invest in improving the digital infrastructure, working conditions, and financial and political independence of HR decisions, addressing the contextual factors identified by Heslina and Syahruni (2021) and Ohemeng, Obuobisa-Darko and Amoako-Asiedu (2020), to develop the self-reinforcing cycle of improved talent practices leading to enhanced engagement, which in turn drives improved organizational performance and thereby encourages further organizational investment in human capital development in the public sector MDAs in Uganda.

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