

# CORRELATION BETWEEN TRANSPORTATION SYSTEM DEVELOPMENT AND THE PERFORMANCE OF THE MANUFACTURING SECTOR IN KENYA

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**Abstract:** This study sought to determine the correlation between transportation system development and the performance of the manufacturing sector in Kenya. This is because; in Kenya contribution of the manufacturing sector to the country's GDP has been decreasing for the last three years posting 8.4%, 7.9%, and 7.6% in 2019, 2020, and 2021 respectively. The study used primary and secondary data to achieve this objective. Data was collected using a questionnaire, documentary analysis guide, and group interview schedule. The data was sourced from 254 managers of manufacturing firms in Kenya, selected by purposive, stratified, and quota sampling. The data were analyzed using a t-test, one-way ANOVA, regression, and correlation analysis. Descriptive statistics namely mean frequencies, percentages, and standard deviations were also used. Qualitative data was analyzed using themes. The findings revealed that the transport system had a positive significant relationship with the performance of the manufacturing sector in Kenya. The null hypothesis was rejected. The challenges facing manufacturers included high taxation, low demand, and transport issues.

**Keywords:** Infrastructure, Manufacturing sector, Infrastructure development, Manufacturing Sector Performance, Transport Infrastructure.

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## I. INTRODUCTION

Manufacturing is the value-added method that transforms raw materials or components substances into merchandise for use or sale using machines, labor, tools, chemicals, or biological processing (Levinson, 2017; Manggat, Zain, & Jamaluddin, 2018). Manufacturing connection has transformed from the 19th century to date, and anticipate further changes in the future. It is essential to expect the evolving manufacturing requirements in Kenya to make suitable investments in infrastructure today, considering the long delays and high costs of infrastructure development. On the other hand, Transportation changes stimulate changes in manufacturing.

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The manufacturing sector's performance was adversely affected by a general slowdown in economic activities, mainly due to measures founded by the government to curb the spread of COVID-19 (KBS, 2021). These measures resulted in decreased use of manufactured goods globally. Value-addition in this sector reduced by 0.1 % compared to a rise of 2.5 % witnessed in 2019. The manufacturing sector contributed to 7.6 percent of the global GDP in 2020. Infrastructure development has continued to attract global and national attention due to its substantial input to the continued growth of the economy (Saxena, Chotia & Rao, 2018). Federal governments have remained the leading financiers because of the high infrastructure investment and development costs. Recently, it has been seeking alternative sustainable financing source through campaigns such as Private-Public Partnerships (PPPs) that involves the private sector (Poole, Toohey & Harris, 2014).

Transport is among the sectors used by African Development Bank to derive African Infrastructure Development Index (AIDI) (AfDB, 2011). AfDB uses AIDI to assess the status of infrastructural development in Africa. Among other things, the economic recovery strategy recognized that the poor state of the physical infrastructure including rails and roads had derailed economic productivity. Kenya Policy Blueprint envisions that no region in the country will be termed 'remote' by 2030. Therefore, the policy prioritizes the growth of transport connectivity in the country as outlined in structural reforms noted in Medium term projects 2 (MTP II). An effective transport sector can enhance trade both locally and regionally by expanding markets and enabling access to remote parts.

**Statement of the problem**

Most developed countries attained the status through industrialization, which involved a change of labor and capital from agricultural production into the manufacturing sector, thus increasing the share of manufacturing value-added in the gross domestic product (GDP). Unfortunately, for Kenya, the share of the manufacturing sector to GDP has been on a declining trend for the period 2019, 2020, and 2021 posting 8.7%, 8.4%, and 7.9% respectively (KNBS 2021). The government of Kenya has continued to emphasize the importance of manufacturing sector growth to realize economic transformation and increase living standards for its citizens. The sector was expected to grow its share in GDP to 10 percent from 2008 to 2017 to recognize the annual 10 percent GDP growth as envisioned in the Kenya Vision 2030; however, this has not been realized as the sector's current share is recorded at 7 percent (the Republic of Kenya, 2021). The Government of Kenya has continued to prioritize this sector in its development plans and policies to stimulate it and benefit from its potential. Recently, the Government of Kenya emphasized the revival and growth of the manufacturing sector under the set "Big Four Agenda." Under the "Big Four Agenda," the government targets to grow the share of the manufacturing sector in GDP to 15 percent by 2022 (the Republic of Kenya, 2018). Most studies in Kenya have focused on the relationship between government expenditure on infrastructure and economic growth, precisely road infrastructure expenditure, and economic growth. Chingiro and Mbulawa (2016), Mugambi (2016), and Njoro (2016) concluded that transport and energy infrastructure have a positive and significant contribution to driving the economic competitiveness of Kenya. However, none of these studies analyzed the relationship between transport development and manufacturing performance in Kenya that the current research is anchored on. It is on these bases that this study needs to determine the relationship between transportation system development and the performance of the manufacturing sector in Kenya.

**Objective of the Study**

To determine the correlation between transportation system development and the performance of the manufacturing sector in Kenya

**II. THEORETICAL FRAMEWORK****Development Theory**

Before expounding on the correlation between institutional theories and contemporary international development agencies, it is imperative to understand the theoretical and practical aspects of modern-day development. Development theory is a model that evolves perpetually where the past precepts are likely to influence future policy development and implementation (Ulyssea, 2018).

Therefore, investment in public infrastructure projects like roads and their outcomes relies on how current development is conceptualized by the government and development agencies. Furthermore, the developmental philosophies followed by the citizens and government are likely to affect their growth (Hlotywa and Ndaguba, 2017; Shi, W., Cao, J., Zhang, Q., Li,

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Y., & Xu, L. 2014). The principle of development theory strongly focuses on institutions: building and fortifying institutions as well as encouraging projects 'integration with existing entities (Hlotywa and Ndaguba, 2017). Therefore, the government and its agencies concerned with the building of public infrastructure should be inspired by the developmental impacts of investments. This theory was used in this study to establish the relationship between the transport system and the growth of the manufacturing sector.

### Resource Dependence Theory

Resource Dependence Theory indicates that organizations are not able internally to create all the resources and requirements necessary for self-sustenance. Hence, they must develop exchange relationships with other elements of the environment to maintain a steady supply of resources (Kairu, 2013). Therefore, Resource Dependency Theory regards strategic collaborations as an approach used to leverage other firms' resources to access an internally unavailable competitive edge (Zuiderwijk, A., Janssen, M., & Dwivedi, Y. K., 2015). Increasingly organizations are combining efforts to tackle complex societal concerns. Particularly, it has been postulated that these engagements may be relevant to the customs perspective. The tension between the rising amount of work and decreasing resources forces customs to outsource resources from private firms to achieve policy obligations (Zhang and Preece, 2011). Additionally, resources of information and power afforded by customs are essential to the commerce sector. This theory was applied in this study to establish the relationship between transport system development and the performance of the manufacturing sector in Kenya.

## III. RESEARCH METHODOLOGY

This study used a mixed methods research design which is a correlational and descriptive design that enabled the collection of empirical evidence to test the relationship between infrastructure development and the performance of the manufacturing sector in Kenya.

## IV. RESULTS AND DISCUSSIONS

### Demographic Analysis

The majority of the participants were males (N = 192), which represented 75.6% of the participants while the remaining 24.4% (N = 62) were females (Table ). Descriptive analysis using frequency also revealed that most of the participants had either 3 to 4 years of experience (25.6%) or 5 and above years of experience (25.6%). However, 24.4% of the participants had either less than 1 year or 1 to 2 years of experience. Generally, while 48.8% of the participants had at most 2 years of experience, 51.2% had more than 2 years of experience. In other words, the number of participants with more than 2 years of experience was slightly higher than those with less than 3 years of experience. Since most of the participants had at least 3 years of experience (51.2%), the findings would be reliable because most of the participants were well-versed in the factors under investigation.

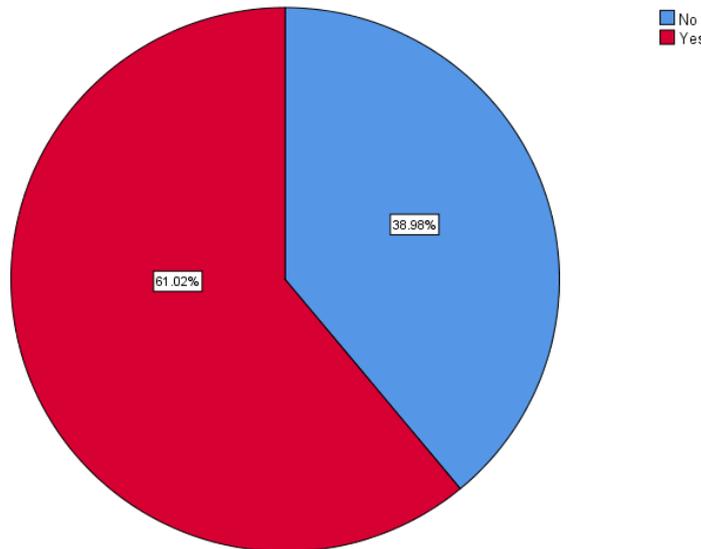
A descriptive analysis of the educational level was also performed using frequencies. The results revealed that most of the participants (44.5%) had at least a university-level education. The percentage of participants with a technical and secondary level of education was 30.3% and 25.2% respectively (Table ). Since the highest percentage of participants had at least a university education level, it is evident that the responses in this study are reliable because highly educated individuals are more likely to give responses that are more reliable than lesser-educated individuals.

### Transportation System Development and Performance of the Manufacturing Sector

This research objective aimed to investigate whether there was a significant relationship between transport system development and the performance of the manufacturing sector. The objective was addressed using Pearson's correlation and simple linear regression. In this case, the transport system infrastructure was the independent variable, whereas the performance of the manufacturing sector was the dependent variable.

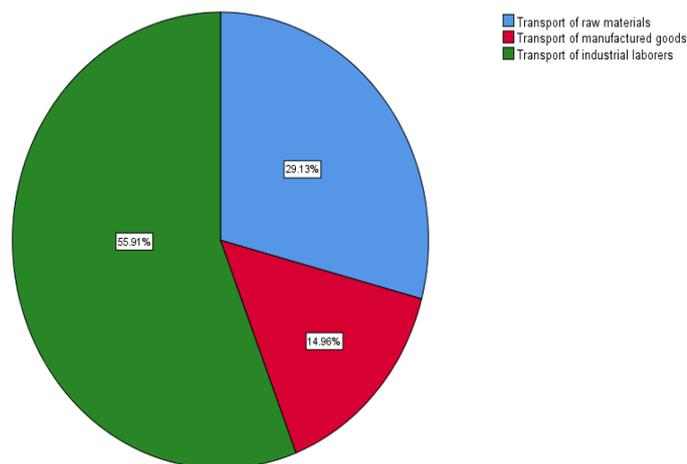
As a preliminary investigation into transport system infrastructure, the participants were required to indicate their belief on whether transport system infrastructure contributes to more than 70% of successful manufacturing firms. Out of the total participants, 61.02% agreed while 38.98% disagreed (Figure 1). This confirmed that most of the respondents were aware of the significance of transport system infrastructure in enhancing the manufacturing sector. Thus, the participants were

more likely to give reliable and valid responses to questions related to the role of transport system infrastructure on the performance of the manufacturing sector.



**Figure 1. Do you believe transport system infrastructure contributes more than 70% of successful manufacturing?**

As a follow-up question, the respondents were required to indicate how the transport system infrastructure contributes to the manufacturing sector. Based on the analysis, the highest percentage of the participants (55.9%) indicated that the major role of transport system infrastructure in the manufacturing sector is the transportation of industrial laborers. While 29.1% of the respondents indicated that transport system infrastructure plays a major role in transporting raw materials, 15% of the participants indicated that the major role of transport system infrastructure is the transportation of manufactured goods (Figure 2).



**Figure 2. Do you believe transport system infrastructure contributes more than 70% of successful manufacturing?**

Pearson's correlation was performed to determine the direction and strength of the linear relationship between transport system development and the performance of the manufacturing sector. The results revealed that there was a moderate positive and significant linear relationship between transport system development and performance of the manufacturing sector,  $r(254) = 0.67, p < 0.001$  (Table 1). This implies that as the transport system development increases, the performance of the manufacturing sector increases. Conversely, as the transport system development reduces, the performance of the manufacturing sector also decreases.

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**Table 1: Correlation between Transport System Development and Performance of Manufacturing Sector**

		Transport infrastructure	Performance
Transport infrastructure	Pearson Correlation	1	.674**
	Sig. (2-tailed)		.000
	N	254	254
Performance	Pearson Correlation	.674**	1
	Sig. (2-tailed)	.000	
	N	254	254

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

A simple linear regression analysis was further performed to investigate the impacts of transport system development and the performance of the manufacturing sector in Kenya. The results showed that transport system development significantly influences the performance of the manufacturing sector,  $F(1, 252) = 209.72$ ,  $p < 0.001$ ,  $R^2 = 0.454$ . 45.4% of the variability in the performance of the manufacturing sector was explained by the development of transport system infrastructure. The regression coefficients ( $\beta = 0.567$ , 95% CI [0.490, 0.644]) further revealed that a unit increase in the development of transport system infrastructure was associated with 0.567 units increase in the performance of the manufacturing sector (Table 2).

**Table 2: Regression Coefficient for Transport System Development and Performance of Manufacturing Sector**

Model		Unstandardized Coefficients		Standardized Coefficients		95.0% Confidence Interval for B		
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	4.312	1.074		4.014	.000	2.196	6.428
	Transport infrastructure	.567	.039	.674	14.482	.000	.490	.644

Notes. IV – Transport Infrastructure Development, DV- Performance of Manufacturing Sector,  $F(2, 251) = 209.72$ ,  $p < 0.001$ ,  $R^2 = 0.454$ ,  $R^2_{adj} = 0.452$ .

The above study finding concurs with a study by Arnold, Javorcik, Lipscomb, and Mattoo conducted in 2016 on the Services reform and manufacturing performance in India who established that a transport system positively influenced the performance of manufacturing firms. The findings are also in agreement with another study by Wang, Törngren, and Onori,(2015) who were investigating the Current status and advancement of cyber-physical systems in the manufacturing sector and found that the transport system plays a key role in the growth of the sector.

This study investigated the relationship between transport system infrastructure and the performance of the manufacturing sector in Kenya. The findings showed that there was a moderate positive and significant relationship between the variables. In addition, regression analysis revealed that transport system infrastructure positively and significantly influenced the performance of the manufacturing sector. These findings indicate that the performance of the manufacturing sector could be improved through increased development of transport system infrastructure.

These findings were consistent with various studies (Aschauer, 1989; Barro, 2003; Eddington, 2006; Moomaw, Mullen, & Williams, 2008). Aschauer (1989) investigated the effects of public infrastructure on the performance of the manufacturing sector in the US. They found that slow transport system infrastructure development significantly contributed to the low productivity of the manufacturing sector. In line with the current study's findings, Aschauer (1989) revealed that there was a positive relationship between transport system infrastructure and the performance of the manufacturing sector. In addition, Aschauer (1989) posited that decreased government expenditure on public infrastructure was among the primary grounds for slow economic growth in the US. These findings suggest that economic growth is also associated with the development of transport system infrastructure. Specifically, increasing the development of transport system infrastructure enhances the performance of the manufacturing sector, which greatly and significantly increases a country's economic growth.

Similarly, Moomaw's et al. (2008) findings agreed with the current study's findings. They investigated the effects of transport system infrastructure and the economic productivity of a country and concluded that a positive association exists

between economic output and public transport system infrastructure. This implies that economic productivity increases with an increase in the development of public transport system infrastructure and decreases with a decrease in the development of public transport system infrastructure. These findings indicate that the development of transport system infrastructure plays a vital role in enhancing the economic performance of a country through the increased performance of the manufacturing sector.

Furthermore, consistent with the current study, Barro (2003) argued that the development of an effective public transport system reduces reliance on car transport, ultimately reducing overcrowding and pollution. This enables the transport sector to reduce concerns linked to longer-term population and employment expansion in a sustainable trend. With the reduced delays, the performance of the manufacturing sector increases. Additionally, Eddington (2006) found that transport system infrastructure is an important pillar in ensuring a profound transport system of the industrial raw materials and manufactured goods to and from the industries. This consequently enhances the performance of the manufacturing sector, which further contributes to increased economic growth. Generally, it is evident that increased development of transport system infrastructure significantly improves the performance of the manufacturing sector, which further contributes to increased economic growth and development.

## V. SUMMARY, CONCLUSION, AND RECOMMENDATIONS

### 5.1 Summary of the Findings

Exploratory data analysis was performed to understand the association between demographic variables (gender, age, education level, manufacturing firm, work experience) and respondents' perceptions of the performance of the manufacturing sector and transport system infrastructure development. These findings indicate that gender did not influence respondents' perception of the transport system infrastructure development and performance of the manufacturing sector. The results showed no significant difference in perceptions between the three strata (make to order, make to stock, and make to assemble). This implies that respondents' perceptions of transport system infrastructure development and performance of the manufacturing sector were independent of strata.

The study further investigated whether respondents' years of experience influence their perceptions of transport system infrastructure development. These findings indicate that the respondents' perceptions of transport system infrastructure development and performance of the manufacturing sector were independent of employees' years of experience. In addition, the researcher examined the effects of education level on participants' perceptions of transport system infrastructure development, and the performance of the manufacturing sector. The findings showed no significant difference in perceptions based on the employees' level of education. This implies that employees' education status did not significantly influence their perceptions of transport system infrastructure development, and performance of the manufacturing sector.

The data were also analyzed to investigate the relationship of different age groups on respondents' perceptions of transport system infrastructure development, and performance of the manufacturing sector. The results showed no significant mean difference in perceptions between the various age groups.

The research objectives were then addressed using Pearson's correlation and regression analysis. The results showed that there was a moderate positive and significant relationship between transport system infrastructure development and the performance of the manufacturing sector. This implies that the performance of the manufacturing sector increases as the development of transport system infrastructure increases and decreases as the development of transport system infrastructure decreases. In addition, regression analysis showed that transport system infrastructure development positively and significantly influences the performance of the manufacturing sector. This implies that the development of transport system infrastructure enhances the performance of the manufacturing sector in Kenya.

### 5.2 Conclusion

There exists a relationship between transportation system development and the performance of the manufacturing sector in Kenya as shown by the findings of this study and backed by results from other studies such as Démurger, (2001), on Infrastructure Development and Economic Growth who was attempting to explain the regional Disparities in China, found out that, transport facilities and modern telecommunication are key for growth and development. Further study A study by Cigu, Agheorghiesei, Gavriluță, & Toader (2018) on transport infrastructure development, public performance, and long-

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run economic growth in 28 European countries indicated that there are significant effects between growth, transport infrastructure, and Public Sector Performance.

Transport infrastructure significantly and positively influences FDI in the long-run and economic growth in the short run. In conclusion, therefore the current study revealed that transport system infrastructure significantly influences the performance of the manufacturing sector. Thus, for sustainable performance in the manufacturing sector, the government should invest more in transport.

**5.3 Recommendations**

A study by Lawrence (2020) on the relationship of government infrastructure development expenditure on the performance of manufacturing in Kenya recommended that government should concentrate more on the development of transport infrastructures such as roads, railway lines, expansion of airports and sea ports for faster movement of goods and other products to boost the performance of manufacturing sector hence increasing its share in GDP. For the sustainability of growth and performance of the manufacturing sector in Kenya, the ministry of transport should come up with policies and frameworks that bring the private sector, non-governmental organizations, and even the county governments as the units of development to guide the growth and development of the manufacturing sector.

The key findings of this study, therefore, have important implications for the manufacturing sector in Kenya. Based on these key findings, the significant impact of the transport system on the performance of the manufacturing sector indicates a need for continuous infrastructural improvement for the sustainable performance of the manufacturing sector. Thus, the government should implement policies that support the development of transport system infrastructure, especially in areas, where the manufacturing industries are located. By so doing, the performance of the manufacturing sector will increase, which will consequently lead to increased economic growth and development.

The Government should concentrate more on the development of transport system infrastructures such as roads, and railway lines, and expansion of airports and sea ports for faster movement of goods and other products to boost the performance of the manufacturing sector hence increasing its share of GDP. In pursuit of the "Big Four Agenda" manufacturing pillar - the government should shift from incurring expenses on power connectivity to the expansion of roads, railway construction, expansion of sea and airports.

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