Effect Of Boat Transport Mode On Cost Of Goods In Lamu Island, Kenya

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Abstract

Transportation, considered a leading indicator of economic performance, has become vital in modern society as it enables economic activity by connecting people, businesses and resources. The study seeks to analyze the effect of boat transport on cost of goods in Lamu Island, Kenya. Using descriptive survey, the primary data for this study was collected from 42 major businesses. A structured questionnaire with Likert-type scale questions was used. A pilot test was run on 6 businesses and reliability measured using Cronbach's alpha and found to be $\alpha=0.90$. Secondary data was obtained from books, journals, newspapers and websites. Data was subjected to computer aided statistical analysis that included descriptive statistics and correlation analyses. The results revealed that boat capacity, boat reliability and absence of transport alternatives are negatively correlated with cost of goods at *p*-value < 0.05 meaning that the researchers can be 95% confident that the relationship between variables is not due to chance. The study found that using boats alone to ferry cargo contributes 5-10% of the cost of goods yet the channel is narrow and about 5km only. Inadequate transport affects businesses and increases price of goods, burdening the consumer and affecting the overall competitiveness of the region. The study found that businesses 'buffered' stock as a safeguard against delivery failure. Recognizing that regional economies are shaped by unique geostrategic conditions, the study recommends increasing transport alternatives to lower cost of transport thus reducing cost of goods. This will increase the economic productivity of the region and improve the welfare of the community.

*Keywords:*Boat transport; Price of goods; Capacity of transport; Reliability of transport; Transport alternatives.

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1.0 Introduction

1.1 Background

Transport or transportation is often defined as mobility, the movement of people and goods, measured in terms of travel distance and speed while transport costs/rates/prices are the price of transportation services paid by their users for moving a unit of freight between a specific origin and destination [32]. Accessibility is the ability to reach desired goods, services, activities, and destinations. The ultimate goal of most transport is accessibility [23]. Boats, in this study, refer to domestic non-conventional vessels that are coastal in operations but not covered by international Conventions like the Safety of Life at Sea (Solas). For this study, they include speed boats, boats, dhows etc.

Transport in the 21st century is, in both physical and financial terms, a leading worldwide sector affecting the movement of goods, services and people [7]. Whether it is, in some manner, comparatively more significant than what it was before, is hard to express. Nonetheless, movements of people, merchandise as well as information have always been important parts of mankind and history. Most certainly, the major civilizations of yesteryear placed appreciable work and focus on their transport systems and many, such as the Phoenicians, the Romans, the Chinese and the Dutch, primarily based their economies on their distinctly unique transport systems. The Chinese have always been a land power while the Dutch and the Phoenicians are the masters of maritime trade [7].

Present social and economic activities have been connected with a tremendous surge in mobility and greater levels of accessibility across the world. The industrial revolution played a role in this but it tremendously increased in the second half of the 20th century as trade was liberalized, economic blocs surfaced and also the comparative advantages of global labor and resources were used more effectively [31]. Nevertheless, these conditions are interdependent with the capacity to manage, maintain and expand movements of passengers and freight as well as their underlying information flows. And, as modern societies become more and more dependent on their transport systems to support a wide variety of activities, satisfy mobility needs and support economic development, establishing adequate transport systems has been an ever increasing difficulty to many remote regions.

Looking at a particular region's transport system may make it appear special or unique. Certainly in some ways, this will inevitably be so, but there are broader trends and features that transcend physical boundaries and many of the challenges that confront policy makers are almost global in their incidence - inaccessibility being an obvious example for these remote regions.

Although some regions gain from the development of transport systems, others are often marginalized by a set of conditions in which inadequate transportation plays a role. Transport by itself is not a sufficient condition for economic growth [33]. Parkinson as cited in [33] also notes that the empirical evidence suggests that areas with low levels of development seldom lack just good accessibility - they have disadvantages other than or in addition to transport inaccessibility, such as lack of sites or of skilled labor. True, there are many factors that affect development yet the lack of transport infrastructures can be seen as a repressing element on development [25]. This is particularly evident in developing countries where the absence of transportation infrastructures is impacting productivity by conferring not only higher transport costs, but also delays, making supply chain management unreliable. A poor transport service level can negatively affect the competitiveness of regions and businesses and thus have a negative impact on the cost of goods, regional added value and even employment. From that perspective, looking at transport alone as a factor of economic growth may not be necessarily biased but a way of starting from the known to unknown. Indeed in 2007, the World Bank published its first ever report which ranked nations according to their logistics performance based on the so-called Logistics Performance Index [2]. Investment in transport infrastructures is thus seen as a tool of regional development, particularly in developing countries, and

Lamu Island is therefore a prime target for such investment.

Lamu archipelago is a chain of islands, 2 degrees below the equator along Kenya's coast, separated from the mainland by a narrow channel bordered with dense mangrove forest and protected from the Indian Ocean by coral reefs and large sand dunes. Lamu, town, island and archipelago, all of the same name, has many historical sites, a proof of the area's long and rich history which, when combined with all the natural attractions of its tropical setting, make Lamu a wonderful place to visit.

The naturally protected harbor on its northeast side led to the founding of Lamu town which became a center of coastal commerce. Today, Lamu's economy is still dominated by maritime activities: shipping, fishing, mangrove cutting and shipbuilding. The people of Lamu are devout Muslims and the town is a place of religious pilgrimage where Muslims from all over eastern Africa gather for one week every year for Maulidi, the prophet's birthday. According to 2009 census, Lamu County has a population of 101,539 and its land area is 6,167 km² [27]. Lamu is remote even by Kenyan standards. Boats and dhows are used to ferry goods over the channels but there are no cars on the island and the way of life from long ago is largely intact. The people use carts, donkeys and strong youth to transport goods along the narrow, cool and quiet streets of Lamu, that are surprisingly intimate spaces enclosed by massive stone buildings whose thick coral rag walls give the town its distinct color and texture.

For over a thousand years up to 19th century, Lamu traders had been exporting ivory, mangroves, oil seeds, grains, cowries and tortoise shells. They were rich traders who sailed their dhows to Arabia and India and brought back coveted oriental silks, spices and porcelain. Sadly and gradually, in 19th century, the town declined but maritime transport still remained dominant as the most used mode of transport. Indeed, whether you travel overland or by air, the final leg of your journey to Lamu will be by a ferry boat! The once prosperous Lamu has been marginalized and poverty is prevalent [8]. In fact other regions have overtaken Lamu and the government's recent focus on this region is an attempt to regain its long lost glory in international trade.

Transport is a critical influence on the origin of cities and on the continuing importance of competitive cities [6] [25]. At each stage of a region's development, a particular transport mode has been developed or adapted. However, it has been observed that throughout history that no single transport mode has been solely responsible for economic growth. Instead, modes have been linked with the function and the geography in which growth was taking place [31]. As globalization consumes our nation, and devolution [8] [19] [27] takes root in various remote regions, alternative transport systems must be established to reduce transport costs and delays and thus engender economic development so as to keep pace with the global economy thus begging the question; could overreliance on non-conventional vessels alone have led to the gradual decline of the once mighty Lamu?

1.2 Problem Statement

From the above perspective, transport performs a vital role in virtually any economy or region- especially where it's lacking- affecting development and the wellbeing of populations. The research concentrates on the effect of boat transport cost of goods. When transport systems are efficient, they provide economic and social opportunities and benefits that result in positive effects such as better accessibility to markets, hence reduced product prices [31]. When transport systems are deficient in terms of capacity or reliability, they can have an economic cost such as reduced or missed opportunities. Efficient transportation reduces costs, while inefficient transportation increases costs. Transportation is a cost, to a greater or lesser extent, of virtually every other good or service in the economy. Transportation is also an enabler of economic activity and a facilitator of trade, an indicator of economic activity, perhaps a leading indicator. Efficient transportation can therefore reduce cost of living [28].

While some regions have benefitted from transport improvements, others -particularly islands like Lamu- have been neglected since independence by successive governments. In 2013, the Commission on Revenue Allocation (CRA) came up with a list of 14 out of 47 counties, including Lamu, classified as marginalized using the County

Development Index (CDI) [8]. As a leading indicator of economic activity [28], it is therefore critical that an anatomy of the effect of boat transport on cost of goods in Lamu be carried out. Inefficient and costly transport infrastructure lacks capacity, proper intermodal transfer (interface), integration, reliability and appropriate alternatives.

For fiscal year 2013, the government's budget requested Kshs 3.7 billion (US$42.65m) to be allocated to LAPSSET project [19] [27]. While this is important, the challenges facing transportation cannot be addressed by simply spending more money. Money must be used exactly where it is needed. Population continues to grow, particularly in Lamu Township, and looming problems from the anticipated growth in travel are not being adequately addressed. As performance degrades and the system grows increasingly unreliable, the economic implications are significant, including wasted resources, lost time and businesses incur increased costs.

This study will try to fill these gaps by investigating the effect of boat transport on cost of goods in Lamu Island. Improving the transportation system, by making it accessible, affordable and reliable for all people and goods, is critical in reducing price of goods and sustaining Lamu's economic growth.

2.0 Literature Review

2.1 Theoretical Framework

It is extremely difficult to measure the exact relationship between transport infrastructure investment and regional productivity; although some theoretical analyses indicate the presence of significant impacts [25]. Norwood and Casey [28] also argue that the relationships linking transportation and the current economic climate are very complex and poorly comprehended.

2.1.1 Neo-classical Growth Model

The principal theory concerning transport and economic development is established around Solow's neo-classical growth model [25] where it is reasoned that continued increases in investment bears upon economic growth rate only temporarily. The rate of capital to growth increases and the marginal product of capital declines, with the economy moving back to a long-term path with output growing at the same rate as the workforce, with a positive factor to reflect improved productivity. There are diminishing returns to capital accumulation. This productivity term is determined outside the model and has resulted in criticism, as productivity gains are seen as one of the main promoters of economic growth.

2.1.2 Endogenous Growth Theory

More recently, the endogenous growth theory approach has been developed to include productivity gains clearly inside the model. Furthermore, economic growth is viewed as incorporating other key elements like innovation and the investment in human capital. This results in increasing returns to scale as the definition of capital is extended to include innovation and human capital. However taxes may also rise, making it difficult for investment. Innovation may indeed reduce costs, but there needs to be the appropriate mechanism present to invest in innovation [25]. All factors influence economic growth. The total productivity argument requires all factors of production to be used to measure output (land, labor and capital), and that transport should be viewed both as an investment opportunity (to increase capital) and as the means to obtain a more efficient management and use of the system [25].

These new approaches are similar to those developed by [4], in that transport is not seen as a necessary condition for economic development, but as one of a range of important supporting conditions 'when other necessary conditions are at work'. The necessary conditions relate to the economic externalities, investment factors, and political factors. Neither of these factors on their own can result in economic growth, unless all others are also in place. [6] study on

cities and competitiveness, and also cited by [25] appears to support [4] and indicates that the range of potential factors in promoting competitiveness is clearly very wide, and transport plays just one part in providing for 'the right business environment'. However, more recent authors like [31] maintain that transportation is an economic factor of production (just like land, labor and capital) of goods and services, indicating that comparatively limited alterations might have considerable influences on costs and prices, locations and performance.

Transportation being a significant enterprise with considerable direct and indirect effects on economic productiveness and gains of any business, region or country [28][31]. Therefore whatsoever impedes the free transit of cargo and people in any region, let alone Lamu Island, can have serious economic ramifications. [28] continue to explain that transportation is a cost, to a more or less degree, of practically all goods and services in the economy, thereby agreeing with [31]. Transportation, being an enabler of business activity and trade, is considered a mirror image, a gauge of economic activity, possibly be a leading index, inasmuch as physical movements come before financial transactions and inasmuch as goods must be moved to markets [28]. Table 1 summarizes the varying perceptions about the significance of transport in an economy. Some authors view it as a necessary condition while others view it as a supporting condition.

Table 1: Transport as a condition for economic performance

Transport condition	Author
Necessary condition for economic performance	• [31], [17], and [22] view transport as an economic factor of production that affects product prices • [28]view transport as a mirror image of economic activity of any region • [25] view transport as an investment opportunity (to increase capital)
Supporting condition for economic performance	• [4] view transport as one of a range of important supporting conditions 'when other necessary conditions are at work'. • [6] and [25] views it as just one part in providing the 'right business environment'. {The necessary conditions relate to the *economic externalities* (Land, Labor), *investment factors* (Capital), and *political factors}*

The above theories instigated the three research questions:
- What is the effect of capacity of boat transport on price of goods in Lamu Island?
- What is the effect of reliability of boat transport on price of goods in Lamu Island?
- What is the effect of transport alternatives on the price of goods in Lamu Island?

2.2 Conceptual Framework

The goal of this study is to investigate effect of boat transport on cost of goods in Lamu Island. The researcher used the following model, Figure 1, to study the three effects of transport on cost of goods. As shown in Figure 1, the dependent variable of the study is cost of goods (price of goods). The independent variables are capacity of transport, reliability of transport and transport options. All these factors affect cost of goods in one way or the other hence economic performance.
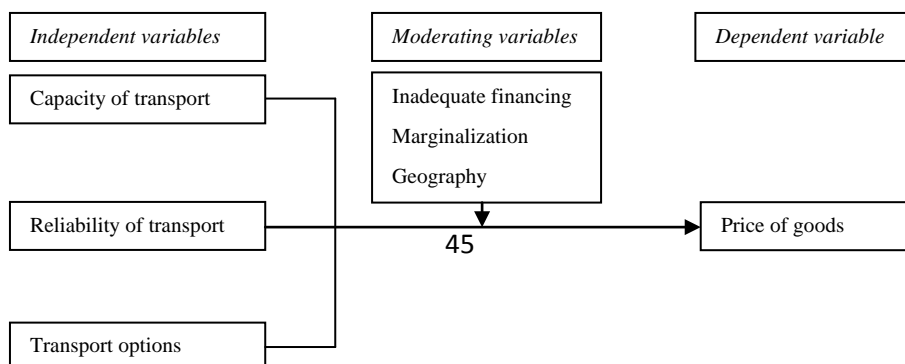

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Source: Author (2013)

Figure 1: Conceptual Framework

2.3 Transport and the Economic Benefits

In our modern society, a region's attractiveness now arguably depends not so much on geographical location, but on the knowledge and skills levels of the population and access to high quality transport and communications infrastructure [25]. Starting from a general perspective, the economic impacts of transportation can be direct and indirect: Direct effects tend to be associated with accessibility changes where transport causes wider markets as well as enables the saving of *lots of time and costs*. Indirect impacts are related to the economic multiplier effect in which the *asking price of goods fall and/or their variety improves*[31].

The major impacts of a reliable and efficient transport on economic processes have been categorized by [31] as geographic specialization, large scale production,increased competition, and increased land value. As a result of the aforementioned impacts, funding transport infrastructures, to make them efficient and reliable, could therefore be viewed as a means of regional development, especially in developing nations, even though the direction of causality between transport and wealth creation isn't necessarily apparent [11]. While the conventional hypothesis is always that transportation investments tend to be more wealth generating in lieu of wealth consuming investments such as services, several transportation investments can be wealth consuming should they basically offer comfort, such as parking as well as sidewalks, or service a market size very well below any potential economic return with, by way of example, projects marked "bridges to nowhere". In that perspective, transport investment initiatives tend to be counterproductive by depleting the resources of an economy rather than creating wealth and extra opportunities. Additionally, there is a propensity for transport ventures to have declining marginal returns. Even though first infrastructure investments generally have a high return because they offer a completely new variety of mobility choices, the more the system is developed the much more likely additional investment would result in less returns [31].

This indicates rather obviously that the economic influences of transport investments are likely to be considerable where infrastructures were formerly deficient or lacking - as is currently in Lamu - and marginal or fringy when an substantial system is already existing. This means that every development undertaking needs to be contemplated individually [31].

Generally there are extensive perceptions of transport's role in promoting economic competitiveness as outlined below:

A number of authors claim that investment, including road construction, leads to high rates of return, measured in terms of economic growth and productivity improvements (see, for example; [24]; [25] and [34]; another example is [31], for deficient systems).

Others are more cautious, stating that effects do occur, but on a much smaller scale than has been claimed, and that, any contribution to the sustainable rate of economic growth in a more mature economy, with well-developed transport systems, is likely to be modest. Potential direct and indirect effects are differentiated (see, for example, [33]; [4]; and for advanced transport systems, see [31].

The more skeptical viewpoint has, to a certain extent, developed as a critique of the road building agenda [15]; [25], and concerns over the environmental impacts of road schemes, as well as doubts as to claims of economic benefits.

Table 2: Transport and level of economic returns

Returns level	Author
High returns	See, for example, [22]; [25] and [34]; another example is [31] for first infrastructure investments.
Modest returns	See, for example, [33]; [4] and for advanced transport systems, see [31].
Minimal or no returns	See authors cited in [25]. See [31] if transport system serves a market well below any potential economic return, or just offer comfort.

2.4 Transport Capacity, Reliability, Options and Cost of Goods

The purpose of transportation is to change the geographical features of freight, people or information, from an origin to a destination, conferring them an added value in the process [31]. The costs differ, based on a variety of circumstances related to geography, capacity, reliability of modes and infrastructure as well as the availability of alternatives. There are other factors like administrative obstacles, energy, the nature of what is being transported but they are beyond the scope of the study.

Inadequate *capacity* is a fundamental restriction both along a transport path as well as at the terminals (jetties). The capability of a transport system is usually constrained by its movement bottlenecks.Transport networks must therefore deal with requisites to extend their capacity and also to lower the costs of movements. The boats lack capacity to carry containerized goods (as in TEUs) hence carrying fewer goods.Exchange points are very important because they enable the interface between different transport systems, a task typically offered by jetties. In Lamu, the jetties act as the point of interface between the mainland and the Indian Ocean. There is Mkowe Jetty at mainland, next to Hindi area and the Lamu Jetty at the Lamu Island. These lack capacity and are poorly built to handle the ever-growing traffic of vehicles and boats. They are not properly integrated to exploit the benefits of each transport mode so that flows become more reliable and/or less costly. Integration is sought by intermodal transportation. In the case of Lamu, a truck with cargo from Mombasa drops its cargo at Mkowe Jetty to be picked by dhows, boats and speed boats.

Reliability is concerned with the hope that a movement will certainly take place within a specific time and cost range [31]. It is the ability to perform the promised services both dependably and accurately. Reliable service performed is a customer expectation and means that the service is accomplished on time, in the same manner, and without errors every time [30]. Apart from the lowering of costs to shippers, reductions in transit time and/or increases in *schedule reliability* can be expected to also have other significant impacts like allowing businesses to manage their inventories and supply chains more efficiently. Increased reliability, for example, reduces the requirement for "buffer" stocks, inventory held to protect against delivery failure [12].

Transportation options (also called *mobility options*, *transport diversity* and *transport choice*)are defined as the quantity and quality of transport modes and services available in a particular situation [24]. A transport system may be economically inefficient if, for instance, trucks cannot be used to transport heavy loads due to arbitrary regulations or inadequate infrastructure, since this reduces their productivity; but it can also be economically inefficient if residents cannot easily walk and bicycle when running local errands due to lack of across channel bridges, since this forces them to take boat ride for trips that could be made more cost effectively by non-motorized modes [23].\Generally, [23] says that there are two feasible reasons for this insufficiency regarding options: an absence of demand (nobody wants alternatives), or latent/hidden demand (people want alternatives that are not available) as a result of insensitive planning.

In the event that the transport system were more efficient, offering consumers much healthier transport and transport options, and efficient pricing, consumers would most likely prefer to rely more on other transport modes than fishing boats and be better off overall as a result. But transport market in Lamu is distorted due to lack of alternatives, poor pricing and poor government planning policies [23] hence higher transport costs, delays and unfavorable economic repercussions. In general, improving transport options improves competition and accessibility to transport services that results in improved accessibility to products and goods as well as reducing prices for products.

2.5 How Transport Cost Savings lead to Lower Product Prices

The most comprehensive assessment of transport's impact on the economy as supported by theoretical considerations is given by [33]. They suggest that the main mechanism by which changes in transport could have an effect on the economy is by a **change in the costs of movement**. A transport improvement is itself defined as "*Any intervention - whether by infrastructure investment, more efficient transport management, or otherwise - which successfully produces sustained reductions in transport costs, or equivalent improvement in service delivered*" [33:14] for example by saving trip time.

Transport costs have immense impacts on the structure of economic exercises and on global trade. Scientific proof underlines that increasing transport costs by 10% decreases trade volumes by more than 20%. And, although [31]warns that a typical fallacy in evaluating the significance as well as effect of transportation on the economy is to center exclusively on transportation costs, which are generally comparatively low (5 to 10% of the value of a good for efficient systems), research has shown that inaccessible regions like Lamu tend to have higher transport costs, often *twice* as much [32] accounting for up to 20% of the total cost of a product. The consequent higher transport costs hinder the competitiveness of such locations and restrict possibilities. This results in higher costs for many goods (sometimes basic necessities such as food) as most have to be transported, frequently across long distances, through bad roads and an unpredictable ocean. Consumers will pay higher prices, impacting on their welfare (disposable income) and competitiveness [31]. Many researchers agree that bad roads, like the one from Witu to Mkowe, 'have a substantial effect on cost of goods sold to consumers' [18], p. 5. It is therefore not only lack of infrastructure (e.g. a bridge road across the channel or a ferry); it is also lack of a good infrastructure (e.g. a good road to the Mkowe Jetty).

Reduced transport costs may increase business profits, **reduce retail prices**, enhance service quality (more frequent deliveries), and allow tax increases or a mix of these. Even modest efficiency gains can provide significant rewards. For instance, if a business has an 8% annual return on investment and transport represents 16% of its costs, a 5% reduction in transport costs increases profits 10% [22].

Consequently, that is why it is practical to assume that improving capacity, reliability and increasing options, as noted by [33], can lead to reduced transport costs and hence cheaper goods. Although improvements in passenger transportation have important economic implications, freight transportation enhancements that **reduce the costs of moving goods** (and services) to and from markets affect economic productivity more. This happens because the movement of goods is what economists term a factor input in the production of goods. [17]agrees with [31] that much like labor and capital, transportation costs directly affects the price of goods and services and the profits of producers and retailers. Consequently, expenditures that will reduce the cost of moving goods to and from markets (via improvements in reliability, transit times, service levels, etc.) can assist to boost as well as sustain economic development [17].

A conventional abstract view indicates that a transport improvement which reduces transport costs (through shorter journey times and lower operating costs) enables firms to sell their goods more cheaply. This induces increased demand, so that as firms experience superior scale economies, a pure circle of further *cost reductions* and sales

growth is put in motion [25].

In US Department of Transportation, a report by the [12] authoritatively states that improved freight transportation systems **reduce costs** for delivery of goods and services; they also support **faster**, **more reliable** transportation from one place to another. Businesses can then pass the lower costs to consumers, or they can implement further efficiency improvements [33] like reducing inventory held.

Cost reductions that are realized enhance the competitive position of enterprises with access to the improved freight facility or system. Expanded demand can generate economies of scale and improved productivity as enterprises take advantage of these market opportunities—thus inducing another round of cost reduction [12].

The distribution of these economic rewards earned by transport improvements depends on the degree of transport costs. If transport cost is high then prices of goods will be higher [16]. Not only will transport improvements **reducetransport costs,** but also ignite cost reductions all over the logistics chain, including **prices reductions, increased reliability and capacity.**

3.0 Research Methodology

3.1 Research Design

This study will employ descriptive survey design as the 'plan of action for answering the research questions' [20]. Because the human mind cannot extract the full import of a large mass of raw data, descriptive statistics are very important in reducing the data to manageable form since it involves a thorough, meticulous and systematic gathering of data that is then organized, tabulated, depicted, and described clearly [1] by use visual aids such as graphs and charts.

3.2 Target Population and Sampling

According to [14] and [5], a target population provides a solid foundation and first step upon which to build population validity of the study. This study targets all the businesses operating in the Island. However, these businesses may not all be accessible to the researcher. For the sake of population validity, a comparable accessible population will be used [26]. The study will use 42 wholesale and retail businesses in Lamu, registered by Kenya Revenue Authority (KRA) under Value Added Tax (VAT). This population was expected to provide valuable information related to effect of boat transport on cost of goods in Lamu Island because they are at the center of the supply chain, making use of boats for transporting cargo, in effect affecting living standards. According to [26], sometimes the accessible population is so small that selecting a sample is meaningless. Taking the whole population is advised in such cases and, consequently, every member of the population is equally represented.

Table 3: Target Population

Category	Estimated Population
Wholesalers	6
Retailers	36
Total	**42**

Source: Author (2013)

3.3 Data Collection Instrument

The study used primary data in the analysis of the effect of independent variables on dependent variable. One data collection method was used, namely questionnaire method, for the purpose of primary quantitative data. It was

administered with the help of some staff of the selected businesses. The questionnaires were used for the following reasons: a) its potential in reaching out to a large number of respondents within a short time, b) able to give the respondents adequate time to respond to the items, c) offers a sense of security (confidentiality) to the respondent, and d) it is objective method since no bias resulting from the personal characteristics (as in an interview) [29]; [24]. A structured questionnaire, organized according to the major research objectives and utilizing a five-point Likert scale [26] ranging from "1 = Strongly Disagree" to "5 = Strongly Agree" was used. A pilot study was done to pre-test the instrument, make observations, corrections and improvements on it. The final questionnaire produced a reliability coefficient of $\alpha = 0.90$ (Cronbach's alpha $\alpha = 0.901$), thus upholding desirable reliability threshold as suggested by [26] and [30].

3.4 Data Analysis Techniques

Data analysis was done with the aid of the Statistical Package for Social Scientists (SPSS). Data analysis techniques used mainly are descriptive statistics and correlation analysis. Descriptive statistics was used to summarize the data and the distribution of the response variations on effect of boat transport on cost of goods. The findings of this kind of analysis were presented in frequencies, means and standard deviations. The respondents' total scores for the three (3) independent variables about transport quality will be cumulated by adding the respondents' ratings of the sub-dimensions (questionnaire questions) to obtain the indices for the each of the 3 variables, while the scores from the respondents' evaluation about high product prices was consolidated to obtain the product price range index. Pearson's Product Moment Correlation was used to explore the relationships between the boat transport variables and cost of goods in Lamu using correlation analyses. In all the statistical tests and analysis, the researcher used an alpha level of .05.

4.0 Results and Discussion

4.1 Response Rate

Thirty eight (38) out of the forty two (42) questionnaires that were administered were successfully filled and collected. This represented a 90% response rate, thus meeting the acceptable target as suggested by [3] and [10] who root for a 50% minimal return rate, [13] who suggests 60%, and [9] who argues for 80%.

4.2 Characteristics of Lamu Businesses

The highest percentage of the sampled Lamu enterprises (39.5%) had been in operation for between 16 and 20 years, 34.2% had been in operation for over 20 years, 10.5% for 11-15 years, and 13.2% for between 6 and 10 years while 2.6% had been in operation for less than 5 years. Cumulatively, a majority of the enterprises (28 or 73.7%) had been in operation for over 16 years and were therefore in a position to provide objective evaluation of the effect of boat transport on cost of goods.

The performance of the enterprises in terms of supplying and satisfying their customers on a scale where 5 = "Excellent", 4 = "Very good", 3 = "Good", 2 = "Fair" and 1 = "Poor", was analyzed and a majority (almost half) of the businesses (18 or 47.4%) said "Fair", 11 or 28.9% said "Good", while 9 or 23.7% said "Poor". No respondent said it was doing "Very Good" or "Excellent", perhaps a pointer to the significance of this research in addressing the causes of below average performance of businesses in Lamu Island.

As far as the frequency of boat use by businesses is concerned, the study used the following scale: "1 = On Less that once a month", "2 = One or two times a month", "3 = About once a week", "4 = Two or three times a week", and "5 = Most days". Majority (76.3%) of respondents hire boats 'About once a week', 'One or two times a month' and 'Less that once a month' while 13.2% hire 'Two or three times a week' totaling to 89.5% of those who don't own boats. On the other hand only 10.5% own boats hence using them regularly ('Two or three times a week' and 'Most

days'). Those who own boats make more trips and hence perform better in business thus supporting the theory that transport is a significant condition for performance [22][25][31].

4.3 Correlations between the Characteristics

The Pearson product-moment correlation (PPMC) coefficient was used to measure the strength and direction of association that exists between the three characteristics. A Pearson's correlation attempts to draw a line of best fit through the data of two variables, and the Pearson correlation coefficient, *r*, indicates how far away all these data points are to this line of best fit (i.e., how well the data points fit this new model/line of best fit).

Table 4: Correlations of business characteristics

		Business operating period	Business performance	Boat use frequency
Business operating period	PPMC	1		
	Sig. (2-tailed)			
	N	38		
Business performance	PPMC	.306	1	
	Sig. (2-tailed)	.062		
	N	38	38	
Boat use frequency	PPMC	.294	.666[**]	1
	Sig. (2-tailed)	.073	.000	
	N	38	38	38

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

The data showed no violation of normality, linearity or homoscedasticity. There was a strong, positive correlation between 'how well a business is performing' and 'how often the business uses boat transport', which was statistically significant $r(36) = .666, p < .0005$ (at $p = 0.05\%$ level) meaning that the researcher can be 95% confident that the relationship between these two variables is not due to chance. This apparently contradicts our objectives that point an accusing finger at boat transport as the cause of poor business performance! Does it mean the more frequently boats are used the better businesses perform? No. Performance characteristic tells us that no enterprise is performing 'Very Good' or 'Excellent' with majority (71.1%) doing either 'Poor' or 'Fair' with a mean of 2.05. The relationship simply underpins the theories that transport is a significant as well as a supporting condition for economic productivity [25][31][33]. However there was a marginal, positive correlation between 'how well a business is performing' and 'how long the business has been operating', which was statistically significant $r(36) = .306, p < 0.1$ (at $p = 10\%$ level). Also marginal and positive was the association between 'how often the business uses boat transport' and 'how long the business has been operating' which was statistically significant $r(36) = .294, p < 0.1$ (at $p = 10\%$ level).

4.3 Descriptive Analysis of Independent Variables

Table 5: Descriptive Statistics

Boat transport factor	Min	Max	Mean	Std. Dev.
1. Capacity variable				
i. Lamu Island is easily accessible	1	3	1.50	.647
ii. I am satisfied with efficiency of boat transport	1	4	1.50	.862
iii. I do satisfy and supply customers due to adequate transport	1	3	1.79	.811
iv. Boat transport as the most available mode is competitive	1	4	1.89	.981
v. How often do you use boat transport?	1	5	2.45	1.224
2. Reliability variable				
vi. Delays in delivery of cargo injure business	1	4	1.68	.809
vii. When boats promise to transport cargo by a certain definite time, they do	1	4	1.63	.751
viii. I prefer my cargo take at most 1 hour from Mkowe jetty to my store	1	4	1.74	.978
ix. I always buffer stocks	1	4	1.74	.921
3. Transport options variable				
x. Transport improvements reduce prices of goods	1	4	1.87	.741
xi. Transport improvements increases productivity	1	3	1.42	.642
xii. Transport improvements reduce delays	1	4	1.87	.741
xiii. Lapsset project should include Lamu in improvements	1	3	1.39	.595
xiv. I prefer ferry to other possible alternatives	1	5	1.63	.998

The means and standard deviations of respondents' rating of the three characteristics of boat transport are shown in Table 5. While analyzing data in Transport Options variable, the questionnaire data was re-coded from "1 = Strongly Disagree", "2 = Disagree", "3 = Neutral", "4 = Agree" and "5 = Strongly Agree" to "5 = Strongly Disagree", "4 = Disagree", "3 = Neutral", "2 = Agree" and "1 = Strongly Agree" in order to obtain consistency (negative effect in case of absence of transport options and improvements) and validity of data considering that the questions for that variable are framed to show the positive effect of transport improvements. The negative effect of lack of improvements and transport alternatives is what is affecting cost of goods hence the need to recode in SPSS.

The findings in Table 5 revealed that the mean scores for capacity ranged from 2.45 (highest) to 1.50 (lowest). The highest mean related to "How often do you use boat transport?" while the lowest mean was related "Lamu Island is easily accessible" and "I am satisfied with efficiency of boat transport". Compared to Reliability, Capacity and Options variables had some of the lowest means. These findings imply that generally, compared to Reliability, boat transport capacity and availability of options for transport had fundamentally basic infrastructure that needed major improvement.

With regard to reliability, the findings indicate that the highest mean of 1.74 was obtained in "I prefer my cargo take at most 1 hour from Mkowe jetty to my store" and "I buffer stocks" while the lowest (1.63) was realized in "When boats promise to transport cargo by a certain definite time, they do". All had the minimum rating of 1 (Strongly disagree) and a maximum rating of 4 (agree). However, the mean of 1.63 supported by a standard deviation of 0.751 indicates that the respondents' ratings were not significantly different.

While capacity and transport options had some sub-dimensions with 5 as the highest rating, reliability had 4 as the highest rating meaning that many businesses prefer increased capacity and competitive alternatives of transport than reliability of transport. For example many respondents prefer a ferry than the boats currently in use. While a ferry will improve reliability, it will improve capacity and make transport more competitive.

4.4 Descriptive Analysis of Cost of Goods Dimension

Table 6: Descriptive statistics of Cost of Goods Dimension

Dimension on cost of goods	Min	Max	Mean	Std. Dev.
High cost of goods is attributable to boat transport	1	5	4.11	1.181
Between 5-10% of price of goods attributable to boat	2	5	4.39	.946
I always pass the above costs to my customers	3	5	4.42	.793

Table 6 indicates that all the three sub-dimensions have 5 as the highest rating and their means are above 4 (averaging at 4.30) meaning that the businesses attributed the high costs of goods to high transport costs. The costs are passed to consumers (high mean = 4.42).

4.4 Correlation Analysis of Variables

The PPMC was conducted to determine the relationships between the independent variables and price of goods. Table 7 shows the correlation matrix of the variables.

Table 7: Correlations between the Variables

		Price	Capacity	Reliability	Transport Options
Price	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	38			
Capacity	Pearson Correlation	-.597**	1		
	Sig. (2-tailed)	.000			
	N	38	38		
Reliability	Pearson Correlation	-.517**	.703**	1	
	Sig. (2-tailed)	.001	.000		
	N	38	38	38	
Transport Options	Pearson Correlation	-.439**	.623**	.776**	1
	Sig. (2-tailed)	.006	.000	.000	
	N	38	38	38	38

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

The findings revealed that there was a significant negative relationship between capacity and price of goods which was statistically significant $r(36) = -0.597$, $p < .0005$ (r = -0.6, n = 38). The relationship was very strong and significant at the 0.01 level of significance, indicating that the businesses who rated boat capacity lowly had indicated highly that the prices of goods are high. These findings concurred with [31] and [25] whose study found that a negative relationship between capacity of transport and cost of goods.

The PPMC analysis indicated that there was also a significant negative relationship between reliability and price of goods $r(36) = -0.517$, $p < 0.05$ (r = -0.5, n = 38). The relationship was strong and significant at the 0.01 level of significance. Higher cost of goods was associated with delays in delivery of cargo by the boats resulting in other indirect costs (like the use buffer stock) that increase product prices. The findings were consistent [17] who had earlier reported that reliable transport will reduce the need to buffer stock.

The PPMC analysis also found that there was a marginal but negative relationship between transport options and cost of goods $r(36) = -0.439$, $p < 0.05$ (r = -0.44). The correlation was significant at the 0.01 level of significance, indicating that higher costs of goods were associated with lack of transport options. This confirms that increasing or improving transport options (alternatives) will reduce the price of goods in Lamu Island. The findings agreed with prior studies including [33], [16], [22], [23], [24] and [25].

5.0 Conclusions and Recommendations

5.1 Conclusions

Adequate transport infrastructure is a necessary condition [25], [31] as well as a supporting condition [4], [33] for reducing the cost of goods, especially 'when other necessary conditions like *economic externalities*, *investment factors*, and *political factors* are at work'. In Lamu, the 'extra' transport costs due to inefficiencies are 5-10% of price of the products sold. This is higher than normal and in agreement with [31] who argues that transport costs for deficient transport infrastructures are almost twice as the normal transport costs (10% for efficient transport infrastructures). These costs are passed to consumers or absorbed by the business (very rare though). The 'extra' transport costs can be avoided by embracing transport improvement solutions like conventional ferries.
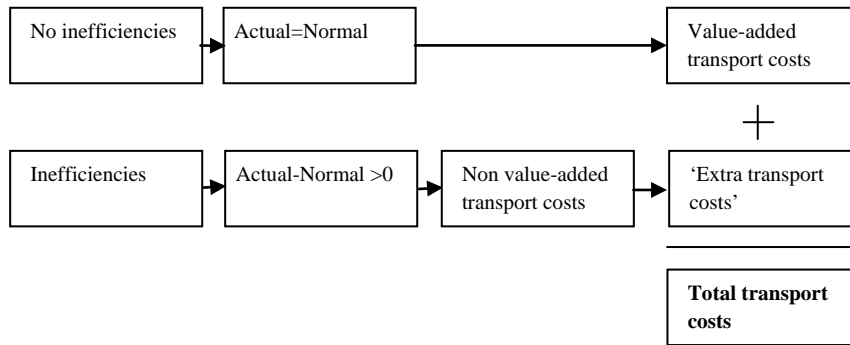
```
┌─────────────────┐   ┌─────────────────┐                    ┌─────────────────┐
│ No inefficiencies│→ │ Actual=Normal   │──────────────────→ │ Value-added     │
│                 │   │                 │                    │ transport costs │
└─────────────────┘   └─────────────────┘                    └─────────────────┘
                                                                      +
┌─────────────────┐   ┌─────────────────┐   ┌─────────────────┐  ┌─────────────────┐
│ Inefficiencies  │→ │ Actual-Normal >0 │→ │ Non value-added │→ │ 'Extra transport│
│                 │   │                 │   │ transport costs │  │ costs'          │
└─────────────────┘   └─────────────────┘   └─────────────────┘  └─────────────────┘

                                                              ┌─────────────────┐
                                                              │ Total transport │
                                                              │ costs           │
                                                              └─────────────────┘
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Figure 2: Total Boat transport Costs as a Sum of Value-added and Extra costs

Fig. 2 shows the total boat transport costs (TC) as a sum of value-added and extra costs. The extra transport costs = non-value adding transport costs within a distribution network, i.e. the difference between the actual transport costs and ideal transport costs that could have been incurred if there were no inefficiencies. Value-added costs are those that are incurred in normal operation of transport and account for around 5-10% of price of a product in an ideal (normal) situation.

5.2 Recommendations

A region's attractiveness and competitiveness depends not so much on geographical location, but on the knowledge and skills levels of the population and access to high quality transport and communications infrastructure [25]. The study makes the following recommendations:

- A system-wide, rather than mode-specific, approach to transportation planning and funding that could also improve focus on outcomes that users and communities desire from the transportation system.
- Such an approach in transport improvement must have the following desired outcomes (1) improving the physical condition of the transportation system, (2) reducing transportation time from origin to destination, (3) increasing the reliability of trip times, (4) increasing access to transportation systems, and (5) reducing the cost of transportation services.
- Transportation planning agencies at national, county and local level adopt a close cooperation and coordination relationship.
- Improve the quantity and quality of alternative modes, at least to the degree that could be self-financing, and more if justified to achieve objectives such as reduced transport costs and delays. Example is availing ferry services.
- Involve the local community in the development and evaluation of transport alternatives.
- Reduce bias in transport planning and investment. Public sector policy makers should integrate and streamline the regulatory framework and investment priorities as well as providing a favorable political environment for investors.
- Apply least-cost planning (LCP) principles to transportation investments. LCP is a strategic planning process that uses the principles of benefit-cost analysis as its underlying evaluative framework in estimating direct costs and benefits.
- A greater understanding of the full life-cycle costs and benefits of various mobility improvements is needed to take a more system-wide approach to transportation planning and funding.
- In the search for empirical evidence, the study found that direct statistical and ex-post case-study evidence on the size and nature of the effects of transport cost changes on cost of goods is limited. The study recommends further studies to investigate the extent, size and nature of these effects and preferably a

linkage model be established to show whether an improvement's effect will be major, modest, minimal or even negative.

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