



## Dwindling Research Funding and Its Effect on Technology Development: Case Study (Intermodal: Computerization of Trucking and Loading Systems, Congestion on the Bridge)

*Sule Abiodun*

*Research Scholar, Niomr Research Lagos, Nigeria*

### ABSTRACT

One of the primary causes of traffic congestion in Lagos state is truck loading which seems to block access to the ports and surrounding environment. The ports play host to millions of containers on arrival into Nigeria, and the means of evacuation is the road, which have become very congested and leading to roads becoming clogged and bridges strained. Human traffic warders are sometimes corrupt and allow taking bribe from commuter get on the way of their duty. For this reason a more advanced and technological driven media, such as intermodal transportation and computerization has been employed for used since a number of years ago. The result of this study indicated clearly that although adopting intermodal transportation and computerization would have improve the condition of Nigeria, however, the implementation of the innovation is not widely accepted as it intended to. This study seeks to investigate the dwindling research funding and its effect on technology development with attention to intermodal: computerization of trucking and loading systems, congestion on the bridge. With a sample of 269 and the used of questionnaire to collect data which was analyzed descriptively. The result indicated that although intermodal transportation and computerization has been employed for used since a number of years ago in Lagos state, its implementation is still below average and thus need to be properly improved by enforcing strident measure to ensure compliance.

**Keywords:** Intermodal, Transportation, Computerization, Research Funding And Technology Development

### 1 Introduction

In every economy, having an effective freight transportation system is important as it enables a quality life to be lived in a country. According to Ranaiefar (2012), the objective behind innovative transportation systems is to encourage the utilization of existing transportation systems, and physical infrastructure while minimizing the negative impact of freight transport on the environment as a means of enhancing safety and ensuring security. The ability to develop innovative solutions in regards to freight management and handling activities tends to encourage the use of intermodaltransport and minimize handlingcosts at terminals (Gattuso and Pellicanò, 2014). In the USA, the development of automated transport systems has recorded success as it has been in use since the early 1950s, and optimized the flows of materials, as well as reduced labour needs (Flamig, 2016).

Intermodal transportation refers to the use of more than one mode of transportation, such as rail, in the movement of goods between destinations. The rationale behind encouraging intermodal transportation is to minimize the occurrence of damage, reduce delay in delivery time, minimize cost, limit the direct handling of cargo through the use of standardised containers, and to improve security (Paddeu, Calvert, Clark & Parkhurst, 2019). Moody (2016) observed that the queuing of containers ships outside the ports and trucks along the roads is caused by the limited number of ports which leads to freight congestion issues. Container ships also pose other problems during their loading and unloading operations such as queues of lorries caused by the fixed scheduling systems, which takes a lot of time to be checked, thus contributing to slowing down the process (Paddeu, Calvert, Clark & Parkhurst, 2019).

In the bid to promote socio economic development in a country, investments in research is always believed to be a foremost step. Research is seen as an intended means to an end rather than an end goal in itself. Flamig (2016) noted that previous research interventions did not succeed in their objectives making the problem to be intractable. In seeking to understand challenging situations, research is taken up and funds injected for

the purpose of knowledge creation that can ease future development activities. Well-funded research is revealed to enhance economic growth and technological development through the discoveries made. By implication, research discoveries can be hindered by limited research funds, when experiments requiring funds cannot be executed as a result of inadequate funding. The use of computerized loading system in USA and Europe has been met with success, however, despite its establishment in Nigeria, it seems not to be effective given the congestions still encountered on roads and bridges. It appears that the situation is more challenging than is presented and requires a greater level of research that investigates the use of intermodal transportation, computerized trucking systems with the objective of reducing congestion in the ports and on the roads, and how to enforce compliance. The indication of this is that limiting research funds is an obstacle to technological development. According to the gates foundation website, in addition to supporting a research develop new products and technology, there should be support given in how the research findings can be delivered and implemented.

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## 2 Problem of study

In Lagos state, access to the ports and surrounding environment has turned out to be challenging in recent times. The ports play host to millions of containers on arrival into Nigeria, and the means of evacuation is the road, which have become very congested and leading to roads becoming clogged and bridges strained. It is to this end that intermodal transportation is looked into as the solution to cargo evacuation. Providing solution to this problem also, is the use of electronic call-up system to call up trucks to go in and pick up a cargo, as against the method of truck drivers driving to port locations to wait for days before receiving their cargo which causes heavy road congestion (Anagor, 2020).

Achieving this solution calls for the execution of a greater level of research which must take into consideration the best methods of arresting the situation congestion in ports and on the roads. This use of electronic call up system has been developed, however congestion is still the order of the day; thus indicating a low level of compliance as well as inadequate research carried out to identify the depth of the problem and the best solutions for it. A possible reason could be inadequacy of funds, which limited the execution of well-grounded research into how to make effective use of intermodal transportation and trucking systems in tackling the challenge of congestions. To this end, the present study examines the impact of dwindling research funds on technological development using the intermodal, computerisation of trucking and loading systems, and congestion on the bridge as case study

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## 3 Research objectives

1. To determine the level of compliance among truck drivers since the implementation of intermodal transportation and computerisation of trucking and loading systems
2. Investigate the extent to which the problems of traffic congestion and delay in loading system have been resolved since the implementation of intermodal transportation and computerisation of trucking and loading systems.
3. To assess the effect of limited research funds on technology development in ports.

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## 4 Research questions

1. What is the level of compliance among truck drivers since the implementation of intermodal transportation and computerization of trucking and loading systems?
2. To what extent have the problems of traffic congestion and delay in loading system been resolved since the implementation of intermodal transportation and computerisation of trucking and loading systems?
3. What is the effect of limited research funds on technology development in ports?

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## 5 LITERATURE REVIEW

Ports act as a vital link between sea and land transport and constitute a significant economic activity in coastlines. Port development and productivity play a vital role in economic development of a nation. The importance of research in ports cannot be overemphasized as it is a major element to developing competitive advantage. The key purposes of research are to inform and enlighten action, gather evidence for theories, and add to developing knowledge in an area of study (Leann, 2021). Knowledge is created through research and when this knowledge is

implemented, it aids in resolving or easing constraints to development as well as facilitate new opportunities for development to be explored.

### **Intermodal transportation**

Intermodal transportation can be defined as the movement of large-sized goods in the same steel-based containers from the place of origin to a destination through several transport modes (Bhasin, 2020). It is a usual way of moving goods in present times. Intermodal transfer may include truck, rail, ship, and then truck yet again. Instead of moving goods from one vehicle to the next one in a journey, intermodal transport takes care of these special standardized containers as an alternative and this process is very beneficial (Vector, 2020). These transfers occur in terminals that are specifically designated for them.

Benefits of intermodal transportation according to LaGarore (2020) include:

- It is a lower cost alternative to truckload and it optimizes the efficiency of truck and rail
- It is sustainable and easy to monitor and security is highly increased of cargo
- It reduces congestion on the highway
- It has a reliable capacity
- Improvement of safety as these containers acts as warehouses thereby reducing damage to goods.

Some disadvantages of intermodal transport according to Vector (2020) include:

Structural costs: this is common in developing countries where there is lack of standardization where there are higher infrastructural costs due to shippers manipulating the costs when the container is heavy and requires a crane to move it from the rail to the trucks.

Delays: intermodal transport though cheaper, may be slower in some situations and if that facility is delayed, the time to unload the carrier can be frustrating.

Reliability: there is a high chance of the chain breaking at some point because intermodal transport relies on more than one transport mode and each mode may be overseen by different businesses, requiring more logistical coordination and increased risk.

### **Challenges of trucking system in Lagos ports**

In Lagos ports, a platform known as “ETO” where truckers log on, schedule and get necessary approval to go in batches into ports was introduced by the Nigerian Ports Authority (NPA) as a way of managing traffic congestion (Anangor, 2021). This platform gives clarity on trucks that can go into the port, ascertains whether there is space in the terminal and ensures there is sanity within the ports corridor. ETO’s framework designates approved truck parks and directs trucks on where to go, park and wait to be called up into the port.

Some challenges of the trucking system in Lagos ports (Anangor, 2021) include:

Export cargo challenges: a lot of trucks carrying export cargo approach the port without complete documentation and certification required from supervisory agencies and this is a challenge in terms of readiness of the terminal operators to receive the cargos. This causes congestion within the Apapa corridor and delays in receipt of export goods.

Fake call up tickets: some individuals with dubious intentions sell fake call up tickets to truckers for their personal gain thereby creating confusion.

Tank farms challenges: the tank farms (areas used solely for storage of oil in tanks) within the Apapa port corridor are not part of the call up system as the NPA does not have regulatory oversight of them. Tankers approach these tank farms within Apapa to lift these products and cause serious congestion at the port corridors as ETO does not control their movement.

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## **6 Theoretical framework**

### **Neoclassical growth theory**

This theory was first introduced by Robert Solow and Trevor Swan first in 1956 and states that economic growth is the outcome of three factors which are labour, capital, and technology. This theory indicates that in a state of long-term stable equilibrium, there is no long-term growth in production per capita without technological changes (Sredojević, Cvetanović&Bošković, 2016).

The production function of neoclassical growth theory is used to measure an economy’s growth and equilibrium and is expressed as:

$$Y = AF(K, L).$$

Where Y indicates an economy's gross domestic product (GDP)

K signifies its share of capital

L indicates the amount of unskilled labor in an economy

A is a determinant level of technology

*Economic growth* cannot continue without *technological advancement* as *technological change* has a major impact on an economy (Banton, 2020). Technology boosts labour productivity and grows the output capabilities of labour. Therefore, without technological development in ports, there will be no improvement as growth will be redundant.

## 7 Methodology

The paper adopted descriptive research survey. The population of the study comprised of port workers in Apapa wharf, Lagos. Using random sampling method, 269 employees were selected as respondents for the study. Questionnaires structured on a four point likert scale format was distributed to them and retrieved immediately. Data from the questionnaires were descriptively analyzed using mean and standard deviation.

### DATA PRESENTATION, ANALYSIS AND DISCUSSION

Three hundred and forty-two (342) copies of the questionnaires were distributed but only two hundred and sixty- nine (269) copies were returned. The other remaining 73 questionnaires were not returned or incompletely filled, thus discarded. The result is as presented subsequently

**Research Question 1: What is the level of compliance among truck drivers since the implementation of intermodal transportation and computerization of trucking and loading systems?**

**Table 1: Table showing the level of compliance among truck drivers since the implementation of intermodal transportation and computerization of trucking and loading system**

the level of compliance among truck drivers since the implementation of intermodal transportation and computerization of trucking and loading system					
Variables	Responses	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Truck drivers only arrive at the port when they are called for their cargo	Strong Agree	11.388	3.096	5.318	17.458
	Agree	44.338	3.096	38.268	50.407
	Disagree	39.222	3.096	33.153	45.292
	Strongly disagree	7.294	3.096	1.224	13.364
Rails and water are used by container owners to transport their containers to their destinations	Strong Agree	9.746	3.096	3.676	15.815
	Agree	10.684	3.096	4.615	16.754
	Disagree	45.210	3.096	39.141	51.280
	Strongly disagree	35.357	3.096	29.287	41.427
Handling costs has been minimized due to reduced delay caused by truck congestion	Strong Agree	8.274	3.116	2.166	14.381
	Agree	47.989	3.116	41.881	54.096
	Disagree	34.448	3.116	28.340	40.556
	Strongly disagree	8.795	3.116	2.687	14.903
Trucks drivers make full use of designated parks until they are called	Strong Agree	11.325	3.178	5.095	17.555
	Agree	37.521	3.178	31.291	43.751
	Disagree	40.136	3.178	33.906	46.366
	Strongly disagree	9.290	3.178	3.060	15.520
Every truck has been registered for easy identification and call up	Strong Agree	12.669	3.132	6.529	18.809
	Agree	34.323	3.132	28.183	40.463
	Disagree	45.533	3.132	39.393	51.673
	Strongly disagree	6.565	3.132	.425	12.705

Field Survey (2021)

The table above indicated the respondents' opinions on the level of compliance among truck drivers since the implementation of intermodal transportation and computerization of trucking and loading system. As indicated in the statement majority of the respondents agreed to the statement "Truck drivers only arrive at the port when they are called for their cargo" with a mean score of 44.338; followed by those who disagreed with a mean score of 39.222; then strongly agreed (Mean=11.388) and strongly disagreed (mean=7.294). This shows that while half of the respondents believed that truck drivers only arrive at the port when they are called for cargo; the other halves do not think so. Perhaps, the reasons for their contrary views are based on the fact that they haven't had real contact with the implementation of intermodal transportation and computerization of trucking and loading system. Going through the table above, similar response rate and mean scores are indicated on the other options. This shows that, there is still no general consensus on the level of compliance among truck drivers since the implementation of intermodal transportation and computerization of trucking and loading system. This implies that more than half of the respondents are in agreement that: Truck drivers only arrive at the port when they are called for their cargo; Rails and water are used by container owners to transport their containers to their destinations; Handling costs has been minimized due to reduced delay caused by truck congestion; Trucks drivers make full use of designated parks until they are called; and Every truck has been registered for easy identification and call up. This result is inconclusive given the majority of the respondents selected strongly agreed and disagreed to the statement. This could be concluded that the level of compliance among truck drivers since the implementation of intermodal transportation and computerization of trucking and loading system is not yet ascertain. Although the rationale behind encouraging intermodal transportation is to minimize the occurrence of damage, reduce delay in delivery time, minimize cost, limit the direct handling of cargo through the use of standardised containers, and to improve security (Paddeu, Calvert, Clark & Parkhurst, 2019), it is clear that the implementation of intermodal transportation in Nigeria, especially in Lagos has not reach commendable level. There is need for more force or re-education to attract more compliance; otherwise the policy will remain dormant while the situation remains the same as lots of trucks are still found blocking streets and major roads. Moody (2016) observed that the queuing of containers ships outside the ports and trucks along the roads is caused by the limited number of ports which leads to freight congestion issues. Container ships also pose other problems during their loading and unloading operations such as queues of lorries caused by the fixed scheduling systems, which takes a lot of time to be checked, thus contributing to slowing down the process (Paddeu, Calvert, Clark & Parkhurst, 2019).

**RQ2: To what extent have the problems of traffic congestion and delay in loading system been resolved since the implementation of intermodal transportation and computerisation of trucking and loading systems?**

**Table 2: The extent has the problems of traffic congestion and delay in loading system been resolved since the implementation of intermodal transportation and computerisation of trucking and loading systems.**

The problems of traffic congestion and delay in loading system been resolved since the implementation of intermodal transportation and computerisation of trucking and loading systems					
Variables	Responses	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
The use of intermodal transportation have decongested the roads and bridges	Strongly Agree	46.662	3.502	39.796	53.528
	Agree	33.781	3.502	26.915	40.646
	Disagree	8.698	3.502	1.832	15.564
	Strongly disagree	11.357	3.502	4.491	18.223
There is free entrance and exits from the ports due to less congested	Strongly Agree	9.746	3.096	3.676	15.815
	Agree	35.357	3.096	29.287	41.427
	Disagree	45.210	3.096	39.141	51.280
	Strongly disagree	10.684	3.096	4.615	16.754
The flow of truck traffic within the ports have been reduced to the minimum	Strongly Agree	8.274	3.116	2.166	14.381
	Agree	8.795	3.116	2.687	14.903
	Disagree	34.448	3.116	28.340	40.556
	Strongly disagree	47.989	3.116	41.881	54.096

There is more control and reduced delay in the loading and offloading time	Strongly Agree	9.233	3.846	1.694	16.772
	Agree	44.337	3.846	36.798	51.876
	Disagree	38.956	3.846	31.417	46.495
	Strongly disagree	7.068	3.856	-491	14.627
The process of checking in a container and clearing has become faster	Strongly Agree	12.365	4.100	4.328	20.402
	Agree	51.527	4.100	43.490	59.565
	Disagree	42.137	4.100	34.100	50.174
	Strongly disagree	14.168	4.212	5.910	22.427
There is minimal occurrence of damage to containers	Strongly Agree	33.781	3.502	26.915	40.646
	Agree	46.662	3.502	39.796	53.528
	Disagree	11.357	3.502	4.491	18.223
	Strongly disagree	9.746	3.096	3.676	15.815

Table 2 above indicates the respondents' opinions on the extent to which the problems of traffic congestion and delay in loading system been resolved since the implementation of intermodal transportation and computerization of trucking and loading systems. As indicated in the Table above, the mean score of those respondents who strongly agreed and agreed to the statement: "The use of intermodal transportation have decongested the roads and bridges" are 46.662 and 33.781 respectively. This is high and thus indicated that indeed, the implementation of intermodal transportation and computerization of trucking and loading systems will resolve the problem of traffic congestion and delay in loading system. However, this can only happen if the proposed intermodal transportation and computerization of trucking and loading systems is actually implemented genuinely. Nowadays, Nigeria is seen as a lawless nation, not because of the absence of laws, but because of the low level of compliance of laws. The citizens do whatever they want with impunity. Even law enforcement agencies go against the law with no qualm. If intermodal transportation and computerization of trucking and loading systems is actually implemented genuine, it will reduce traffic reduction. Gattuso and Pellicano (2014) is of the opinion that the ability to develop innovative solutions to freight management and handling activities such as the adoption of intermodal transport minimizes handling costs at terminals. In the USA, the development of automated transport systems has recorded success as it has been in use since the early 1950s, and optimized the flows of materials, as well as reduced labour need (Flamig, 2016). This implies that similar result is likely to occur in Nigeria, if we can diligently implement it. With the implementation of intermodal transportation and computerization, there will be free entrance and exits from the ports due to less congested; the flow of truck traffic within the ports have been reduced to the minimum; there is more control and reduced delay in the loading and offloading time; the process of checking in a container and clearing has become faster; and there is minimal occurrence of damage to containers.

### RQ 3: What is the effect of limited research funds on technology development in ports?

**Table 3: The effect of limited research funds on technology development in ports**

Effect of limited research funds* technology development in ports					
Variables	Responses	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Technology development is hindered	Strongly Agree	46.662	3.502	39.796	53.528
	Agree	33.781	3.502	26.915	40.646
	Disagree	8.698	3.502	1.832	15.564
	Strongly disagree	11.357	3.502	4.491	18.223
It limits the growth of the ports' economy	Strongly Agree	10.684	3.096	4.615	16.754
	Agree	9.746	3.096	3.676	15.815
	Disagree	45.210	3.096	39.141	51.280
	Strongly disagree	35.357	3.096	29.287	41.427
It prevents innovative solutions to	Strongly Agree	34.448	3.116	28.340	40.556

freight challenges from being discovered	Agree	47.989	3.116	41.881	54.096
	Disagree	8.274	3.116	2.166	14.381
	Strongly disagree	8.795	3.116	2.687	14.903

**Field Survey (2021)**

Table 3 above presents the effect of limited research funds on technology development in ports. The result in the table indicates a high mean score to both strongly agree and agree 46.662 and 33.781 respectively which shows a high many respondents agree to the statement. However, the second items received lots of approval to the statement. . Similar result is indicated with the other items in the table as strongly agree and agree dominated the other response option. This result therefore concludes that limited research funds have effect on technology development in ports.

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## 8 Conclusion and recommendations

One of the primary causes of traffic congestion in Lagosstate is truck loading which seems to block access to the ports and surrounding environment. The ports play host to millions of containers on arrival into Nigeria, and the means of evacuation is the road, which have become very congested and leading to roads becoming clogged and bridges strained. Human traffic warders are sometimes corrupt and allow taking bribe from commuter get on the way of their duty. For this reason a more advanced and technological driven media, such as intermodal transportation and computerization has been employed for used since a number of years ago. The result of this study indicated clearly that although adopting intermodal transportation and computerization would have improve the condition of Nigeria, however, the implementation of the innovation is not widely accepted as it intended to. As such more research into the adoption of intermodal transportation and computerization in Lagos needs to be carried out in order to enhance the utilization of intermodal transportation and computerization. With this in mind, this study recommends a further research into the level of acceptability and adoption of intermodal transportation and computerization into of trucking and loading systems. The study recommends that measures be set in place to ensure total compliance of intermodal transportation and computerization into of trucking and loading systems in Lagos state.

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**DWINDLING RESEARCH FUNDING AND ITS EFFECT ON TECHNOLOGY DEVELOPMENT: CASE STUDY (INTERMODAL: COMPUTERISATION OF TRUCKING AND LOADING SYSTEMS, CONGESTION ON THE BRIDGE)**

**REQUEST FOR INFORMATION**

Dear Respondent,

I am carrying out a study on “Dwindling research funding and its effect on technology development: Case study (intermodal: computerisation of trucking and loading systems, congestion on the bridge)” and you have been chosen to be part of the study. This questionnaire is only for academic purposes. Kindly select the response which applies to you and all information will be kept confidential

**SECTION A:**

Instructions: Please tick (√) as appropriate where

SA = Strongly Agree (SA), A = Agree, D = Disagree (D), SD = Strongly Disagree (SD)

**Key: Strongly agree (4), Agree (3), Disagree (2), and strongly disagree (1).**

S/N	ITEMS	SA	A	D	SD
<b>RQ1</b>	<b>What is the level of compliance among truck drivers since the implementation of intermodal transportation and computerization of trucking and loading systems?</b>				
<b>1</b>	Truck drivers only arrive at the port when they are called for their cargo				
<b>2</b>	Rails and water are used by container owners to transport their containers to their destinations				
<b>3</b>	Handling costs has been minimized due to reduced delay caused by truck congestion				
<b>4</b>	Trucks drivers make full use of designated parks until they are called				
<b>5</b>	Every truck has been registered for easy identification and call up				
<b>RQ2</b>	<b>To what extent have the problems of traffic congestion and delay in loading system been resolved since the implementation of intermodal transportation and computerisation of trucking and loading systems?</b>				
<b>6</b>	The use of intermodal transportation have decongested the roads and bridges				
<b>7</b>	There is free entrance and exits from the ports due to less congested				
<b>8</b>	The flow of truck traffic within the ports have been reduced to the minimum				
<b>9</b>	There is more control and reduced delay in the loading and offloading time				
<b>10</b>	The process of checking in a container and clearing has become faster				
<b>11</b>	There is minimal occurrence of damage to containers				
<b>RQ3</b>	<b>What is the effect of limited research funds on technology development in ports?</b>				
<b>12</b>	Technology development is hindered				
<b>13</b>	It limits the growth of the ports' economy				
<b>14</b>	It prevents innovative solutions to freight challenges from being discovered				