POLICY FRAMEWORK FOR BUSINESS CONCEPTS AND MODELS OF URBAN/CITY LOGISTICS OF A DEVELOPING ECONOMY

Adebambo Olayinka Somuyiwa
Associate Professor of Transport Management
Department of Transport Management
Faculty of Management Sciences
Ladoke Akintola University of Technology
P.M.B. 4000
Ogbomoso, Oyo State, Nigeria
Phone: +23 48 033 570 837
E-mail: iseoluwa89@yahoo.com

Scientific paper

Abstract

Urban logistics is indispensable to the economy as it moves not only the goods and passenger but also the concomitant effects of pollution, traffic congestion and noise are major issues of concern. These kinds of condition not only affect the quality of life in urban areas, but also the future city development. Sequel to these, the paper sought to analyse the effect of traffic congestion, noise pollution and other negative externalities on city/urban logistics. This is with a view to determining significantly effect of traffic congestion and other negative externalities on city/urban logistics through business performance. Data for this paper were both primary and secondary, that were collected from various respective agencies. Mostly the primary data were number of vehicles along designated routes; industrial areas, information on negative externalities (Noise, Odour, etc), which were analysed using parametric statistical techniques. Findings revealed that major routes were used by vehicles/motorists as a result of growth and diffusion pattern of industries of different types. Correlation results of these negative externalities indicated range of correlation values of between 0.3 to 0.74, Analysis further showed differential in ranking of industrial areas, based on certain factors identified and discussed, to serve as pointer to where attention should be focused in proposing business concepts/models for urban/city logistics. The paper recommended sustainable transport environment and city development in an holistic manner within the concepts of People, System and Organisation (PSO), with emphasis on internal consistency and complementarity with other policy areas in the economy and the environment.

Key words: Framework, Business, Models, City and Developing

1. INTRODUCTION

The objective of business logistics is to deliver goods/products at reasonable time and satisfy consumer's requirements. In urban contexts, city logistics have been developed for more than fifteen years, providing solutions and methods to support public authorities as well as other stakeholders in urban freight transport planning and management (Taniguchi et al. 2001). Nowadays, two definitions of city/urban logistics are retained. The first is that of Taniguchi et al. (2001) who define city logistics as ''the process for totally optimizing the logistics and transport activities by private companies in urban areas while considering the traffic environment, the traffic congestion and energy consumption within the framework of a market economy''. The second, more related to the vision of Ambrosini and Routhier (2004) and Anderson et al. (2005), is not related to the notion of optimization but to organization. In this sense, we can define urban logistics as the pluri-disciplinary field that aims to understand, study and analyze the different organizations, logistics schemes, stakeholders and planning actions related to the improvement of the different goods, transport systems in an urban zone and link them in a synergic way to decrease the main nuisances related to it. Different stakeholders are seen in urban logistics, having different aims and thereby constituting difficulties for collaborative actions. Public stakeholders (politicians, city planners, public transport managers, regional or national technical services) are on a collective welfare vision and aim to reduce the main nuisance attributed to freight transport, i.e., congestion, pollution, global warming and noise without penalizing urban areas and also while creating employment when possible. Private stakeholders (shippers, transport and logistics operators, retailers, wholesalers, craftsmen, real state stakeholders, tertiary activities, etc.) are on an economic efficiency vision and aim to reduce costs and/or increase service quality, of course with an eye on the environment but not as a primordial criterion.

The main findings of this report show that the most suitable logistic solution is defined not only by the business characteristics, but also by the delivery, product and city area features (logistic profile), as well as the policies adopted/to be adopted for the city. It is the combination of these three pillars that constitute the backbone of the decision making for best urban logistics solutions (TURBLOG, 2011). As Ogden (1992) states the "explicit consideration of urban goods movements has the potential to contribute in a useful and positive way to achieving both the goals of urban transport and some of the broader goals of urban policy and planning". Though, the movement of goods and passengers is indispensable to the economy of the city; the concomitant effects of pollution, traffic congestion and noise are major issues of concern.

According to Marcario (2007), there are factors to consider in urban modeling logistics (agent needs, characteristics of the urban area and characteristics of the products/type of delivery).Even though urban areas and freight movement activities are different around the world, they all have in common that they are complex and difficult to understand (Dablanc, 2011).For the characterization of the city area it is necessary to identify the features that can represent any possible constraints, but also give a picture of the actual state of the art in terms of logistic conditions, such as commercial density and homogeneity, logistic accessibility, or if there are any restrictions applied. The product characteristics are the ones that can determine the type of vehicle to be used or if there are any restrictions, such as easiness of handling and special conditions; and finally the agents' needs or delivery profiles (for example, frequency and urgency of deliveries).However, building a model that will work for all operational urban logistics may be difficult and unrealizable. First, in order to present a broad variety of urban logistics practices around the world, both in developed countries as well as in less developed countries. Each city is also different with regard to its characteristics (for instance size, important economic sectors, transport infrastructure and traditions). Sequel to these, the paper sought to analyse the effect of traffic congestion, noise pollution and other negative externalities on city/urban logistics.

2. MATERIALS AND METHODS

Policy framework for business concepts and models within the context of Urban/City logistics is of academic interest and theoretical importance, especially in developing economy. This is predicated on the fact that most research work have being on freight and passengers movement in both quantitative and qualitative terms, with no emphasis on the aspect that can effectively and efficiently harness the existing situation within the ambit of business concepts towards environmental friendliness and general sustainable city development. Sequel to this, the paper attempts to propose robust policy framework for business concepts in a megacity of a developing economy with the aim to harnessing city development strategies. Data for this paper were both primary and secondary, that were collected from various respective agencies. Mostly, the primary data were number of vehicles along designated and chosen routes, industrial areas, information on negative externalities and others. All these were analysed using parametric statistical techniques that involved Pearson Product Moment Correlation (PPMCC), multiple regression and analysis of Variance (ANOVA).

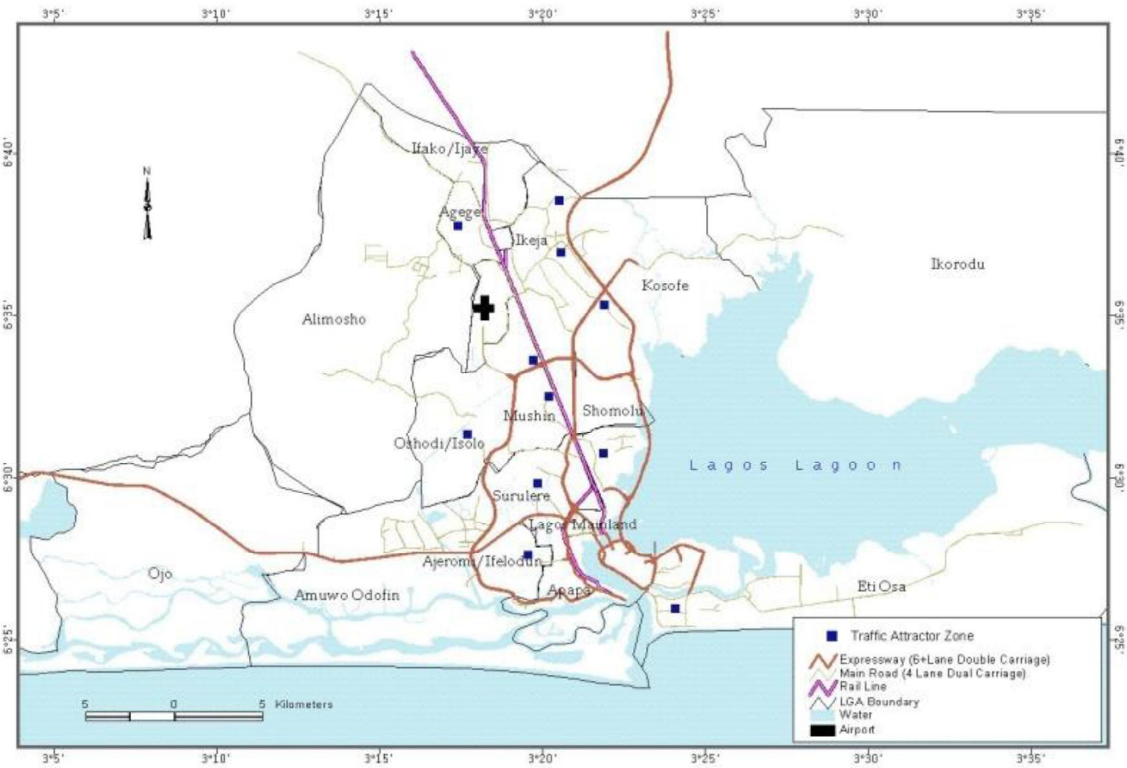
3. STUDY AREA

Lagos metropolis is located in southwestern Nigeria. The boundaries of the area is the territory within latitudes 6°23 N and 6°41°N and longitude 3°9°E and 3'28E. Metropolitan Lagos, however, constitute less than 2.5% of Nigeria's total land area of 923,768km²; meanwhile, Lagos accommodates over 6% of Nigeria's total population of 1991 National Census. The metropolitan area accounted for the seventeen out of the twenty local government areas in Lagos State (Fig 1).

Basically the state lies on low lands, with about 17,500 hectares of built-up area of which residential areas occupy the single largest proportion of 8, 739 hectares (51.9%), Commercial 821 hectares (4..8 %), Industrial, 1,444 hectares (8.4%), Institutional and special use 2,366 hectares (13.7%) open spaces 453 (2.6%) and Transportation 3,205 (18.6%) (Olayiwola, et al, 2005). It is interesting to note that the population characteristics of the state are heterogeneous with most parts of the nation being represented. Again, despite the relocation of the Federal Capital to Abuja, Lagos State remains, undoubtedly, the economic nerve centre of the country. It harbours almost all the headquarters of the multinational companies in the country.

Lagos, occupies a pre-eminent position based on all urban indicators, most especially demography. It should be noted that all other cities are relatively small in terms of commercial, industrial and trading activities in comparison to Lagos. Demographically, the density of Lagos is much higher than other cities in Nigeria. According to Taiwo, (2005), while Nigeria's population density is 100 persons per square kilometre (psk) that of Lagos is about 2,400 persons/ km² with annual population growth rate of between 5.0 to 5.5%.

Figure 1. Metropolitan Lagos



Source: Encarta, (2013)

In terms of transportation, Lagos area is naturally endowed with navigable creeks, lagoons and water body that are suitable for urban transit services. It also has rail line that links the commercial southern part of the city with the dormitory settlement of the North. As a result, Lagos has the potential of benefiting from a seamless transportation system. Ironically, road transport dominates more than 90 percent of all intra -urban movement (Oni, 2004). According to Taiwo (2005) there are about 2,600 km of roads in Lagos. These roads are frequently congested with over 1 million vehicles on a daily basis. Lagos has about the highest national vehicular density of over 222 vehicles/km against country average of 11/km. The major identified corridors with predominant heavy vehicular traffic are Lagos- Abeokuta road, the Lagos-Badagry road axis and the Ikorodu road.

3.1. Industrial structure of Lagos metropolis

Lagos is the most advanced and Industrialized metropolitan in the country and sub Saharan Africa. Its people enjoy a very high standard of living. Basic commodity oriented industries play a key role in the Lagos economy, making Lagos a strong market for high value processed consumer goods. Transportation, communication and trade are in the suburb of the state. Farming is concentrated in the suburb of the state. The leading commodities produced in these parts of the country are vegetables, daily products and grain, while other substantial proportion are brought from other parts of the country because of the availability of market. The economy of Lagos is heavily oriented towards international trade and is open to foreign investments (Somuyiwa, 2012).

The Lagos industry as well as the economy as a whole is undergoing a rapid restructing process during the past decade following a relatively suitable political climate. The business sector is traditionally based on raw material industries such as paper and pulp, iron and other metals. However, the main competitive factor of the country today is knowledge and the flexible uses of knowledge, even the supply of indigenous raw materials are still important elements of the industry. This is witnessed by the city's very fast expansion in the telecommunication industry. There are many industrial companies in Lagos. These are shown in table 2.1 with their relative percentage share of industrial grouping.

Table 1. Composition of Industrial group in Lagos metropolis

Industrial group	Composition (%)
Engineering	14.2
Forest products	6.3
Chemical	34.4
Food	35.7
Others	9.4

Sources: Manufacturing Association of Nigeria (2011); Lagos Chambers of Commerce and Industry (2011; Somuyiwa,A.O (2012)

4. LITERATURE REVIEW AND CONCEPTUAL DISCOURSE

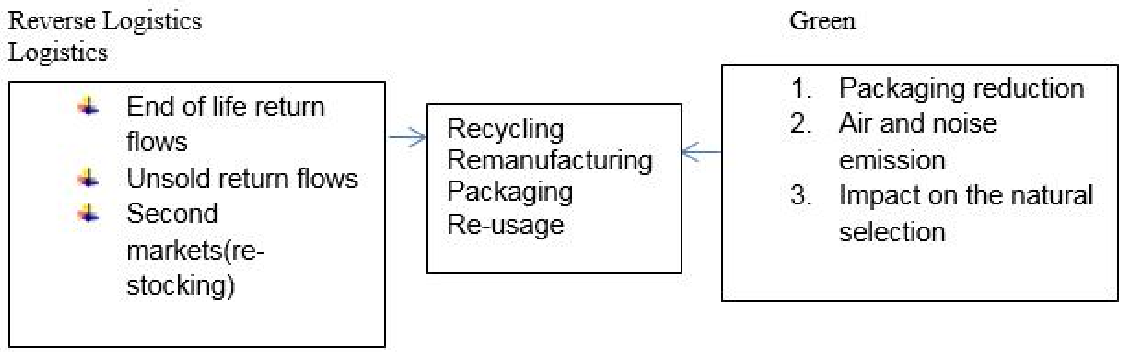
4.1. Concepts of business logistics

In this field, there are several concepts like the eco-conceptionand eco-design (Michelini & Razzoli 2004; Ademe, 2006), the reverse distribution (Carter & Ellram 1998) and the reverse logistics (Rogers & Tibben–Lembke, 1999). Eco-conception and eco-design (related to product design, building and infrastructures with environmental respect targets) are similar concepts that have become popular in the 1990s decade (Michelini & Razzoli, 2004; Le Pochat et al. 2007). Eco-designing products and eco-conceiving infrastructures for logistics purposes encourage a global approach designed to prevent or minimize impacts emerging throughout the whole life cycle of products and infrastructures concerning all types of environmental impacts.

In GrSCM, another important concept is that of reverse logistics, defined by Lambert and Riopel (2003) as the environmentally efficient practices of recycling, reusing and reducing amounts of material used. Dekker et al. (2004) refer to it as the logistics process that concerns the integration of used and obsolete products back into the supply chain as valuable resources. According to Rogers and Tibben- Lembke (2001), it is important to distinguish the green logistics and the reverse logistics concepts because they do not follow the same schemas, although several common points can be found (see Fig. 1. The vision of Green logistics involve eleven domains, i.e. (1) energy and (2) materials conservation,(3) efficient land-use, (4) traffic and congestion reduction, (5) air, (7) water (8) visual, (9) smell and (10) acoustic pollution reduction and waste management, for both (10) conventional and (11) hazardous materials.

Another ‘‘global vision’’ of reverse logistics is that of Lambert and Riopel (2003), who proposed a combination of reverse distribution, green logistics and reverse logistics measures and approaches and where the definition of each component does not exactly meet that of Rogers and Tibben-Lembke (2001).

Figure 2. Connections between reverse logistics and green logistics



Source: according to Rogers & Tibben-Lembke (2001)

4.2. Business models for urban logistics

Diversity in the available definitions poses substantive challenges for delimiting the nature and components of a model and determining what constitutes a good model. It also leads to confusion in terminology, as business model, strategy, business concept, revenue model, and economic model are often used interchangeably. Moreover, the business model has been referred to as architecture, design, pattern, plan, method, assumption, and statement (Morris at al., 2003).

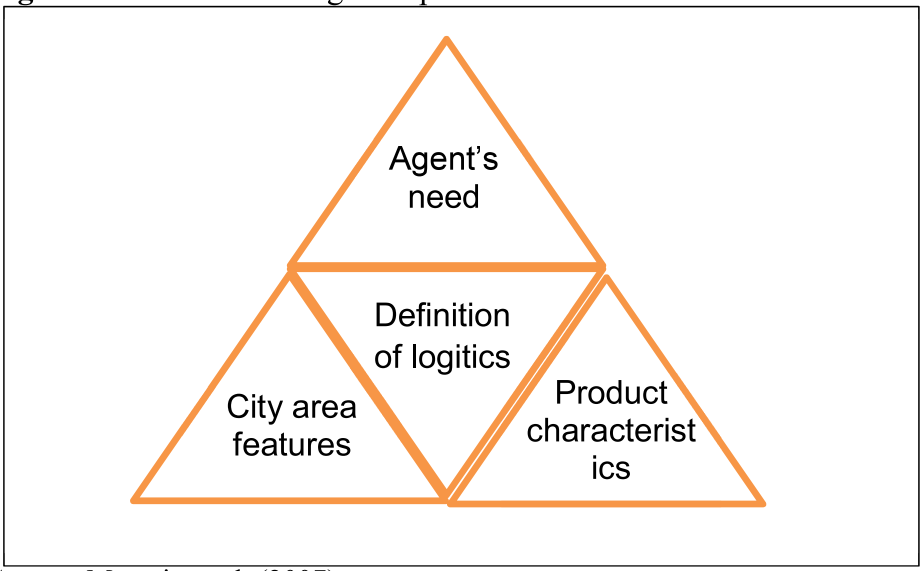
Quantification of the consequences of City Logistics initiatives is necessary for their evaluation and planning. Predicting the impacts of City Logistics initiatives for evaluation purposes requires modelling to be undertaken. Models should describe the behaviour of the key stakeholders involved in urban freight transport. They should also incorporate the activities of freight carriers including transporting and loading/unloading goods at depots or customers.

Models must also describe the traffic flow on urban roads for freight vehicles as well as passenger cars. Models are also required to quantify the changes in costs of logistics activities, traffic congestion, emissions of hazardous gases, and noise levels etc. after implementing City Logistics initiatives.

At the moment, models are limited in their ability to quantitatively predict all the impacts of City Logistics measures. This is because urban goods movement is a very complex system with many stakeholders. Existing mathematical modelling approaches that have developed are currently not sufficient for fully describing entire urban transport systems. In particular, the interaction between stakeholders is not well represented in existing models. Another difficulty encountered when modelling City Logistics comes from the fact that City Logistics involves the economic activities of private companies and vehicle flows on road networks. It is quite difficult to deal with both aspects of logistics activities in a single model. In addition, model calibration and validation is not easy in real situations, because of the lack of appropriate data describing current goods movement patterns. Osterwalder & Yves Pigneur (2010) itemized the followings to be considered before the construction of the model:

- the products and/or services to be provided,
- the means by which such products/services will be provided,
- the mechanisms by which opportunities could be exploited,
- the different actors / agents, roles and relationships,
- the financial flows, investments and incentives.

Figure 2. Definition of logistics profile



Source: Macario et al. (2007)

There are four key stakeholders in city logistics: 1) shippers (2) Freight carrier (3) Residents (consumers) (4) Administrators .Shippers are the customers of freight carriers who either send goods to other companies or persons or receive goods from them. Shippers generally tend to maximise their levels of service, which includes the cost, the time for picking up or delivering, and the reliability of transport as well as trailing information. The reliability of delivering goods has become more important for Just-In-Time transport systems. There are two types of reliability; (a) delivery without any damage to the goods, (b) delivery without any delay with respect to designated time at customers.

Freight carriers typically attempt to minimise the costs associated with collecting and delivering goods to customers to maximise their profits. There is much pressure to provide higher levels of service to customers at a lower total cost. This is especially important when carriers are requested to arrive at customers within a designated time period. However, freight carriers often face difficulty in operating their vehicles on urban roads due to traffic congestion. This has led to the inefficient use of trucks, where smaller loads are being transported and trucks often have to wait near the location of customers when they arrive earlier than the designated time (Somuyiwa & Dosunmu 2008).

Residents are the people who live, work and shop in the city. They do not welcome large trucks coming into local streets, never the less these vehicles carry commodities that are necessary for them. They would like to minimize traffic congestion, noise, air pollution and traffic accidents near their residential and retail areas. Within the commercial zones of urban areas, retailers want to receive their commodities at a convenient time for them. However, this sometimes conflicts with residents who desire quiet and safe conditions on local roads. City administrators attempt to enhance the economic development of the city and increase employment opportunities. They also aim to alleviate traffic congestion, improve the environment and increase road safety within the city. They should be neutral and should play a major role in resolving any conflicts among the other key stakeholders who are involved in urban freight transport. Therefore, it is the administrators who should co-ordinate and facilitate City Logistics initiatives (Somuyiwa, 2012 and 2014).

There are three general types of network models necessary for predicting the effects of City Logistics initiatives, (a) supply models, (b) demand models and (c) impact models. Supply models predict the level of service of the freight system based on network characteristics and demand. Demand models predict the demand for urban goods movement based on industry and resident characteristics as well as the level of service. Impact models predict the financial, energy, social, environmental and economic impacts of City Logistics schemes based on the predicted demand and level of service. There are computer based models and manual models.

4.3. The need for business model

Furthermore, urban freight is strongly interrelated with many other aspects of the urban system: urban passenger system, land use, regional development, socio-economic environment, employment, etc. Thus, it is necessary, when considering urban freight planning, to devote some effort towards understanding its integration within urban mobility planning. As pointed out by Macário and Caiado (2005), acting on urban logistics domains implies intervening in different aspects of urban mobility management, particularly institutional, regulatory, social, infrastructural and technological, therefore requiring the joint and coordinated action of the different stakeholders in the urban logistics arena. Understanding the relationships between the agents of the logistics activities and the major elements that influence the urban logistics is very important to know the functioning of the urban system and define the most feasible “logistic business”.

Osterwalder (2004) developed a model that was successfully applied in large corporations. According to TURBLOG,2011: The logic within this methodology is to describe the business model through nine building blocks that show how an organization creates, delivers, and captures value. Infrastructure Management: how the company efficiently performs infrastructural or logistical issues, with whom and as what type of network enterprise;
Product: what business the company is in, the products and the value propositions offered to the market;
Customer Interface: who the company´s target customers are, how it delivers their products and services, and how it builds a strong relationships with them;
Financial Aspects: what is the revenue model, the cost structure and the business models’ sustainability.
Another important structure of business model can reflect the characteristics itemized below:

- Determination of whom the organization create value
- Factors that can add value by the organization to customer-efficiency, customization, reliability, price, cost reduction and accessibility.
- The channel of reaching the customers-Direct sales, whole sales and the informal channels.
- Personal relationships
- Technology and Innovation
- Cost Associated with Logistics Business Models
- Fixed costs, Variable costs and sunk costs.

4.4. Government policies in urban logistics models

The government has roles to play in urban logistics in terms of policy regulation and enforcement. Enforcement and promotion, e.g. law and regulations enforcement; Traffic management (vehicle), e.g. vehicle size/type and time window restrictions for vehicle emissions movement standards, subsidies for low emission vehicle, fuel taxes; Access conditions, e.g. loading and unloading duration, time and access restrictions; Land use management, e.g. zoning for logistic activities, land use pricing/subsidies; Public infrastructure, e.g. new infrastructure for freight, truck routes (Somuyiwa 2012 and 2014).The policies targeted to urban logistics that a city can adopt are;

Environmental impacts
Reduce pollution;
Reduce the freight vehicles trips (- km);
Reduce noise;

Social impacts
Improve the quality of life;
Reduce accidents;
Reduce congestion;
Improve working conditions.

Rationalizing the urban supply with the ambition to reduce the negative consequences of the multiplication of movements (Taniguchi et al. 2001).
• Maintain the commercial activity and craftsmanship in cities, guaranteeing satisfying conditions for their supplying (Dufour et al., 2007).
• Set in coherence the regulation on deliveries inside the urban transport perimeter (Dablanc, 1998).
Take into account the needs in surface necessary to sustain the activities of urban logistics.
• Lead a reflection on the existing and future infrastructures in the perspective of a multimodal offer. The goal is to mix transports and logistics activities of all kinds of shops (hypermarket, supermarket, convenience store). To cope with this many various needs supply chains are reset, taking into account three dimensioning factors:
• The delivered volume: if a hypermarket needs the deliveries of ten articulated vehicles a day, a small shop will only need ten palettes, and sometimes not even every day
• The delivery frequency: the suppression of storage on the selling spot imposes a just-in-time organization, increasing the number of deliveries and thus the time spent by vehicles in the city.
• The location of the shops in the delivery route: their position relatively to efficient transport infrastructures, the accessibility will impact the delivery time.

4.5. Areas of considerations to excel in business logistics

There were indications from extant research that 'business partnerships were successful because they were implemented through strategic alliances between the companies and the municipality. Of all the logistics activities of production, distribution and supporting activities, distribution is the strongest followed by production and lastly supporting service (TURBLOG, 2011).

Moreover, some business concepts were only effectively implemented because they were sustained by public administration policies, which provided availability of warehouse spaces or accessibilities and, in some cases, financial incentives, resulting in partnerships with the municipality or other government administrations. In order to meet the municipality environmental requirements and restrictions, and also looking forward towards improving the service performance, some companies developed joint ventures to develop these new services.

Some business models combine more than one activity such as the Beijing case study regarding the Tobacco Logistics Centre, which performs a uniform storage, centralised sorting and graded distribution of tobacco for the whole city (Somuyiwa, 2012 and 2014).

Some hauliers operating in a UK pallet network noted that they make their deliveries within a specific postcode area where freight comes in overnight and has a short turn-around time to ensure next day delivery within the specific time window to deliver that freight.
Product charateristics: Size, weight, holding conditions, special conditions, fragility and perishability. Vehicle routing and scheduling problems (VRP) involve an optimisation process of assigning customers to trucks and determining the visiting

order of customers and routes of vehicles. The basic information needed for the VRP is the location of customers, road network conditions, travel times, traffic regulations, etc.

- Company and logistics relationships
- Urgency of deliveries
- Frequency of deliveries
- Vehicle weight and size
- Route planning in delivery.

4.6. Factors that inhibit business concepts and models for logistics

Other important factors that hinder their work are economic and political structures, for example local authority civil servants are responsible for the planning procedures, but it is the political representatives that are responsible for the decision making. Furthermore, historical reasons and cultural traditions could have great influence on the planning procedures. Often urban deliveries are made to premises that have undergone a change of use, for example a small high street convenience store may occupy premises that were constructed some 50 years ago for use as a hairdressers, and therefore delivery access to the store is limited since it had never previously been required from the outset. Others are: indiscriminate parking, collision problem, right of way, carriage of passengers along the road, ceremonies & blocking the road, government's inability to provide bridges, fill potholes/rehabilitate it, incompetent drivers, incessant break down of vehicle as a result of poor maintenance.

5. ANALYSIS AND DISCUSSION

This section presents and discusses results and various analytical tools used as previously mentioned in the methodology section. These techniques include descriptive statistics, correlation coefficient multiple regression and paired t-test order ranking for the Industrial areas. Similarly those routes that were mentioned in the methodology section were used to count the number of vehicles, which was later used as surrogate for transport infrastructure that is dominant factor in the Logistics activities of any city. In furtherance to this, counting along the major routes revealed that, Ikorodu road, Third mainland, Lekki-Epe axis, Eko Bridge, Western Avenue and Agege motor road are often being used by these vehicles in that order; as shown in table 4. 1

Table 4.1. 12 hours traffic count on selected roads in metropolitan Lagos

Roads	**Nos. of vehicles in both direction (12 hours traffic counts)**	**Nos. of vehicles in both direction p/hour**	**Average volume/capacity v/c ratio**

1.	Third Mainland Bridge	356,175	31,355	9.9.1
2.	Carter Bridge	97,982	8,212	1.9:1
3	Eko Bridge	297,360	24,254	5.2:1
4.	Western Avenue	254,670	22,112	4.3:1
5.	Murtala Mohammed Way	76,512	6,234	2.5:1
6.	Herbert Macaulay Way	101,345	13,112	3.5:1
7.	Ojuelegba – Mushin	94,355	8,012	1.6:1
8.	Ikorodu Road.	398,248	32,231	4.8:1
9.	Lekki-Epe Axis	321,346	28,654	5.8.1
10.	Agege Motor Road	165,123	21,231	3.7:1

Sources: LAMATA (2013)
Author's field survey (2015)

Interestingly, the pattern observed is due to the connection between these route and some of the industrial areas. For instance, Third mainland, Ikorodu road and Western avenue are connected to Apapa and other CBD Zones. While Western Avenue and Agege motor road are linked to Ikeja. Consequently, they are been used to facilitate logistics activities. Similarly, Agege motor road is often links adjourning state (Ogun State) which has been enjoying limp frogging advantage of diffusion of industrial pattern from Lagos metropolis like that of Lekki axis. In this case, the route equally enjoys the proposed developmental economic programmes like Free Trade zone, Export processing zone and Lekki port.

Similarly, in line with the cardinal thrust of this paper; to evaluate major environmental concerns of negative externalities, Pearson Product Moment Correlation Coefficient (PPMCC) was adopted and the result indicated a moderately low and high but positive values that devoid multicolinearity and autocorrelation as revealed by Durbin-Watson statistics that showed 1.721.This in turn confirmed that these variables are reliable and suitable for correlation analysis with number of vehicles as dependent and negative externalities as independent variables. The major environmental concerns of negative externalities as identified by Hospitals and medical centers around and along the sampled route are highlighted in table 4.2.

Table 4.2. Variable list description of major environmental concerns of negative externalities.

Variables	Description
NOISE	Noise
POLLUT	Pollution
ODOUR	Odour
ACCIN	Accidents/Injury
HEANA	Headache/Nausea
CHIDIS	Children Diseases
PSYDIS	Psychological Disturbance
SKIRR	Skin Irritation
NOVEH	Number of Vehicles
LUNGP	Lungs Problem
EARPR	Ear Related Problems

Source: Author's Field Work (2015).

It is interesting to note that number of vehicles (NOVEH) is a surrogate for transport infrastructure and tangentially for negative externalities, consequently, is dependent variable. The rationale is predicated on the fact that, the more road is accessible the more is prone to all aforementioned environmental factors. Table 4.3 reveals the descriptive statistics for variables of the major environmental concerns.

Table 4.3. Descriptive statistics for variable of the major environmental concerns of negative externalities.

S/No	Variables	Mean	Standard Deviation
1	Noise	41.62	13.64
2.	Pollution	30.22	11.10
3.	Odour	28.31	10.14
4.	Accidents/Injury	9.17	6.75
5.	Headaches/Nausea	21.05	7.31
6.	Children Diseases	4.33	2.17
7.	Psychological Disturbance	17.19	5.16
8.	Skin Irritation	2.75	1.05
9.	Lungs Problem	4.12	2.34
10.	Ear related Problems	3.11	0.16

Source: Computer Analysis based on Author's Field Survey (2015)

Based on this table, Noise has highest value at mean and standard deviation, which indicates that, is the most prominent environmental factor that affects the inhabitants. This is followed by pollution, while skin irritation with 2.75 and 1.05 as mean and standard deviation respectively brought up the rear. In table 4.4 however, the correlation co-efficient between NOVEH (Number of vehicles) and noise is very high (0.721). This shows that there is high and positive linear relationship between these variables. It implies that the more the higher the number of vehicles the more the noise.

Table 4.4. Correlation co-efficients between the dependent and independent variables

	NOISE	POLLU	ODOUR	ACCIN	HEANA	CHIDIS	PSYDU	SKIRR	LUNGP	EARPR	NOVEH
NOISE	1.000	0.614	0.210	0.132	0.542	-0.142	0.572	-0.012	0.316	0.415	0.721
POLLUT		1.000	0.614	0.240	0.536	0.561	0.591	0.325	0.432	0.534	0.641
ODOUR			1.000	0.322	0.432	0.548	0.356	-0.213	0.446	0.613	0.118
ACCIN				1.000	-0.227	-0.124	0.233	-0.341	0.581	0.732	0.216
HEANA					1.000	0.611	0.536	0.014	0.593	0.578	0.561
CHIDIS						1.000	0.021	0.121	0.711	0.732	0.484
PSYDIS							1.000	0.318	0.536	0.711	0.532
SKIRR								1.000	0.562	0.581	0.351
LUNGP									1.000	0.334	0.431
EARPR										1,000	0.362

NOVEH											1.000

Source: Computer Analysis based on Author's Field Work (2015)

However, there is a very low relationship between, Odour and NOVEH (0.118), this implies that the stench from the area might not be due to the numbers of vehicles that ply the routes, which is related to congestion, but to some other factors which can be relative low sanitation and industrial activities in those areas. Similarly, there is negative relationship among few variables that include ODOUR and SHIIRR (-0.213); NOISE and SKIRR (-0.012); ACCIN and SKIRR (-0.341). Apart from the fact that these values are low, they only expressed direction of their relationship. In the same token, table 4.5 equally reveals regression coefficients.

Table 4.5. Regression analysis model for the negative externalities along the sampled routes

R	R^2	Adjusted R^2	Std Error of the Estimate	F. Ratio	Sig.	Durbin Watson
.0856	.733	.721	1.9431	142.21	0.00	1.548

Source: Computer Analysis based on Author's Field Work (2015)

The result of multiple regressions showed .733 that implies 73.3% of the level of explanation of all those externalities. Therein Durbin Watson statistics was computed to ensure that there was no violation of the assumption underlying the use of regression analysis as regards the existence of auto-correlation among the independent variables, before conducting the regression analysis. The result showed 1.679, which is close to acceptable standard of 2.0. This indicates that there is no auto-correlation problem in the model. Hence the explanatory variables are fit to predict the pattern of negative externalities in those sampled routes and industrial areas.

Moreover, for effective planning process, paired t-test was adopted for ranking of these industrial zones, such that it will be easier to know what, where and how Business logistics model and concept can be adopted. This is revealed in Table 4.6

Table 4.6. Ranking of industrial zones according to paired t-test

Industrial Group	**Apapa**	**Ikeja**	**Marina**	**Victoria Island**	**Lekki Axis**	**Ikoyi**	**Agege Areas**
Food	1	1	2	2	2	2	1
Engineering	1	2	2	2	1	2	2
Chemical	1	1	1	1	1	1	1
Forest product	3	2	3	3	1	3	2

Others	2	1	3	3	1	2	1

'I' indicates the highest mean flow, and "4" is the lower
Source: Based on author's field survey, (2009)

Table 4.6 shows that Lekki axis industrial zone has the highest rank; followed by Agege, Ikeja and Apapa and other industrial zones take the rear. The implication of this is that all routes leading to Lekki axis, Agege and Ikeja areas should be well catered for and planned for urgently such that congestion would be minimized and Business concepts and models for city logistics would be enhanced. Similarly, there must be integration of existing resources to solve the difficulties caused by the impact of increasing population and other logistics activities within these areas.

6. CONCLUSION, PLANNING AND POLICY IMPLICATION AND RECOMMENDATION

The paper opines that Business concepts for Urban and City logistics should revolve around sustainable transport environment and city development, with provision of infrastructure within the framework of strategic management planning and societal marketing concepts that incorporate People, System and Organisation (PSO) on one hand, and on the other hand, ensuring these infrastructure do not only perform human welfares functions by meeting respective users requirements and satisfaction, but also profitable for the organizations that provide them, such that those facilities will give both high immediate satisfaction and high long run benefits. For instance, water transport infrastructure that is underdeveloped and utilized should be developed and improved upon. This will ease the burden on road transport, consequently reduce pollution, congestion and other negative externalities on one hand and enhace movement and other logistics activities in the city. Furthermore, sustainable transport systems policy measures be introduced within the ambit of Transport Demand Management (TDM) that must be developed so as to ensure internal consistency on one hand, and consistency with other policy areas, as well as sustainability in the economy and the environment. Hence, government should develop and guide implementation of transport strategies through 4ps- Politics, Planning, Policy and Public service, which will all ensure steadily improving standards and targets in quality, pollution reduction and safety.

7. REFERENCES

Ademe. (2006). Eco-conception en actions, 2ème édition. Paris: ADEME. Available at http://www.ademe.org

Allen, J. & Browne, M. (2010). Sustainability strategies for city logistics. In: McKinnon, A., Cullinane, S., Browne, M., Whiteing, A. (eds). Green logistics: improving the environmental sustainability of logistics. Kogan Page, London.

Ambrosini, C. & Routhier, J.L. (2004). Objectives, methods and results of surveys carried out in the field of urban freight transport: an international comparison. Transp Rev 24(1), p. 57-77.

Anderson, S., Allen, J. & Browne, M. (2005). Urban logistics—how can it meet policy makers' sustainability objectives? J TranspGeogr 13(1), p.71–81.

Augereau, V. & Dablanc, L. (2008). An evaluation of recent pick-up point experiments in European cities: the rise of two competing models? In: Taniguchi E, Thomson RG (eds) Innovations in city logistics. Nova Science, New York, p.301–320.

Beagan, D., Fischer, M., Kuppam, A. (2007). Quick Response Freight Manual II. Washington, D.C, Department of transportation. Federal Highway Administration. FHWA-HOP-08-010 EDL No. 14396.

Carter, C.R. & Ellram, L.M. (1998). Reverse logistics: a review of the literature and framework for future investigation. J Bus Logist 19(1), p.85–102.

Ciliberti, F., Pontrandolfo, P., Scozzi, B. (2008). Investigating corporate social responsibility in supply chains: a SME perspective. J Clean Prod 16(15), p.1579–1588.

Dablanc, L. (2011). City distribution, a key element of the urban economy: guidelines for practioners. In: Macharis, C., Melo, S. (eds). City distribution and urban freight transport: Multiple perspectives. Edward Elgar Publishing Limited, Cheltenham.

Dekker, R., Fleischmann, M., Inderfurth, K & Van Wassenhove, L.N. (eds). (2004): Reverse logistics: quantitative models for closed-loop supply chains. Springer, Berlin.

GLRT: Global Logistics Research Team (1995): World class logistics: the challenge of managing continuous change, council of logistics management. Council of Logistics Management, Oak Brook.

Gond, J.-P. (2006). Gestion des ressourceshumainesetDéveloppement Durable. In: Reynaud E (ed). Le Développement Durable au coeur de l'entreprise. Dunod, Paris, p.83–116.

Gonzalez-Feliu, J. (2008). Models and methods for the city logistics. The two-echelon vehicle routing problem. Ph.D. Thesis, Politecnico di Torino, Turin, Italy.

Gonzalez-Feliu, J., Morana, J. (2010). Are city logistics solutions sustainable? The Cityporto case.TeMA. J Land Use Mobil Environ, 3(2), p.55–64.

Gonzalez-Feliu, J. (2012). Freight distribution systems with cross-docking: a multidisciplinary analysis. J Transp Res Forum 51(1), p.93–109.

Kahn Ribeiro, S. & Kobayashi, S. (2007). Transport and Its Infrastructure, in Forth Assessment Report; Climate change 2007- mitigation of climate change, Inter-governmental Panel on Climate Change, Geneva.

Lambert, D., Cooper, M., Pagh, J. (1998). Supply chain management: implementation issues and research opportunities. Int J LogistManag, 9(2), p.1–19.

Lambert, S. & Riopel, D. (2003). Logistique inverse: revue de littérature. Les Cahiers du CERAG, n_G-2003-61.

Macário r. et al. (2007). Logurb - Optimização de SistemasLogísticos de Distribuição de MercadoriasemMeioUrbano - state of the art da logisticaurbana, Fundação de Ciência e Tecnologia, Lisboa, Portugal.2007.

Osterwalder, A. (2004). The Business Model Ontology - A proposition in a Design Science Approach, These pour l'obtention du grade de Docteur en Informatique de Gestion.Ecole des Hautes Etudes Commerciales de l'Université de Lausanne. 2004.

Osterwalder, A., Pigneur, Y. & Tucci C.L. (2005). Clarifying Business Models: Origins,Present, and Future of the Concept. Communications of the Association for Information Systems(AIS) Las Vegas, USA. 2005.

Pope, C.A, Burnett, R.T., Thun, M.J., Calle, E..E., Krewsi, D., Ito, K. & Thurston, G.D. (2002) Lung Cancer, Cardo-Pulmonary mortality and Long term exposure to fine participate air Pollution. Journal of the American Medical.

Rao, P. & Holt, D. (2005). Do green Supply Chains lead to Competitiveness ans Economic Performance? International Journal of Operations and Production Management, 25(2), p.898-916.

Rodrigue, J. (2006). Freight and the City: An Overview of Urban Freight Distribution and City Logistics, Maritime Infrastructure Engineering and Management Program, Rutgers University,April 2006.

Rogers, D., Tibber-Lembke, R. (2001). An examination of Reverse Logistics Practices. J Bus Logist 22(2) 129-147.Rushton, A (1979) Improving Goods delivery, National Materials Handling Centre, Cranfield.

Somuyiwa, A.O & Dosunmu,V.A. (2008). Logistics Infrastructure and Port Development in Apapa Port, Nigeria. Pakistan Journal of Social Sciences 5(9), p.953-959.

Somuyiwa, A.O. (2012). Logistic Infrastructure and City Development in a Metropolitan City of Developing Economy. *The 9th International Conference on Logistics and Sustainable Transport: Faculty of Logistics*, University of Maribor, Slovania, and European Association for Traffic and Business Logistcs. 14th-16th June, 2012.

Somuyiwa, A.O. (2014). Business Concepts and Models for Urban Logistics. Being a paper Presented at the National Conference Organised by Chartered Institute of Logistics and Transport (CILT), Lagos Branch. December, 14th 2014.

Srivastava, S. (2007). Green supply-chain management: a state-of-the-art literature review. Int J Manag Rev 9(1), p.53–80.

Taniguchi, E., Thompson, R.G., Yamada, T. Van, Duin R. (2001). City Logistics. Network modelingand intelligent transport systems. Elsevier, Amsterdam.

TURBLOG (2011). Transferability of Urban Logistics concepts and Practices from a worldwide perpective Deliverable 2 Business Concepts and Models for Urban Logistics 7th framework.

Tseng,Y., Yue, W.L. & Micheal, A.T. (2005). The role of Transporatation in Logistics Chain; *Proceedings of the Eastern Asia Society for Trasnportation Studies*, 5, p.1657-1672.