

Information Technology and Systems in Transport Supply Chains

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Abstract

Transportation and movement of goods is one of the most important human needs, the operation of transportation determines the efficiency of moving products. The progress in techniques and information technology (IT) and management principles improves the moving load, delivery speed, service quality, operation costs, the usage of facilities and energy saving. This study deals with the logistics processes in supply chain management, information technology in management and prospects for the use of information technology in the transportation logistics segment, with particular attention paid to the key factors in information technology that affects the efficiency of transport, allows information to be collected on such as traffic volume, flow, average traffic speed, and actual journey time. Such innovative means of gathering data on automobile traffic open up new perspectives for assessing transport accessibility in terms of automobile traffic by providing high-quality data that meet the requirements for use in company. The main purpose of this study is to give a comprehensive review of information technology (IT) and relationship with transport leading to increased competition and improvement of the level of Algerian companies.

Keywords: Transportation, information technology (IT), supply chain management.

Introduction

Globalization is fundamentally changing the environment of business decisions. Corporate decisions have to be increasingly taken in the new context where business operations are subject to worldwide forces of fierce competition. Firms have to respond strategically in order to stay competitive in this arena. Firms have typically two sources for gaining a strategy driven competitive edge: a) the continuous creation of new products and incorporation of new technologies, and b) the firm's decisions on the rationalization of existing operations. (Vesna Aleksić Marić 2012).

Companies today have to deal with new economic parameters. Political and economical moves occur faster than before. Trading zones are built up all over the world. Globalization became a generalized phenomenon that has more or less abolished some borders. Thanks to technical improvements the distances have also shrunk, and the world can be seen as a village. In such an environment, logistics activities can no more be seen as traditional transportation activities. The logistics task has to support economic growth of companies as well as the marketing and manufacturing activities as a result of increased international competition and international corporate mergers (Yung-y.T. and Wen L. Y. 2005). For industries, logistics helps to optimise the existing production and distribution processes based on the same resources through management techniques for promoting the efficiency and competitiveness of enterprises. The key element in a logistics chain is transportation system, which joints the separated activities.(Krumwiede, D.W et al 2002).

Transportation occupies one-third of the amount in the logistics costs and transportation systems influence the performance of logistics system hugely. There are innovative ways in which firms are combining transportation and distribution systems to increase their efficiencies in the globally competitive environment. Though the transportation logistics systems vary with type of product and geographical scope of the market for raw materials, components and finished products, there is a common objective underlying the various strategies. The common objective is to get the right product to the right place at the right time so the cost of holding inventory is minimized (Santash.G.K and Shirich. P. (2014)).

Logistics continues to grow and become a strategic resource that has already requires a certain level of staff and a variety of in-depth knowledge. For the existence of a market economy, transport companies should focus on getting the single most effective economic results in the supply chain. This may contribute to a number of factors, namely formed market of transport services, competition between enterprises and various modes of transport, and others. Thus, due to transportation, logistics of goods movement process is transformed into a single technological chain, and transportation is becoming an integral part of an integrated transport and production process.(Olga . Z. 2013).

Information technology (IT) has transformed many industries, from education to health care to government, and is now in the early stages of transforming transportation systems. While many think improving a country's transportation system solely means building new roads or repairing aging infrastructures, the future of transportation lies not only in concrete and steel, but also increasingly in using IT. IT enables elements within the transportation system—vehicles, roads, traffic lights, message signs, etc.—to become intelligent by embedding them with microchips and sensors and empowering them to communicate with each other through wireless

technologies. IT facilitates effective communication that is critical to the maintenance of value enhancing relationships.

According to Samson. K. N (2014).and Lai et al (2010) it is difficult to have effective communication in today's business world without the use of modern IT. IT enables an organisation and its suppliers to communicate and share information openly and frequently and hence expand knowledge-sharing and understanding of complex competitive issues through greater discovery and disclosure of information. Through the use of IT, firms can share information related to forward and reverse logistics with their suppliers (Samson. K. N.2014). Thus, high levels of IT use between a firm and its supplies are likely to lead to high levels of connectivity, which fosters the integration of logistics activities.

This study focus on the adoption and implication of information technology (IT) in the transport and logistics services. This study shows how companies in the sector use (IT) for managin their transport processes, internally and in exchange with suppliers and customers.

The objective of this study is to provide a broad view on the strategic impact of information technology (IT) usage and supply chain management amplication in the transport sector

Information technology as an enabler of supply chain management

Supply-chain management is a process responsible for development and management of the total supply system of a firm, both the internal and the external components. Prior to 1980s, the transportation and industry has witnessed the evolution of one of the most important trends in the history of logistics, the increasingly sophisticated use of computers. Although these devices and electronic commerce have found applications in transport and industry, the business sector is a major beneficiary (M. Kia, E. Shayan and F. Ghotb 2000). However. During the past two decades, the information flow between functional areas within an organization and between supply chain member partners were paper-based. The paper-based transaction and communication is slow. During this period, information was often overlooked as a critical competitiv resource because its value to supply chain members was not clearly understood. IT infrastructure capabilities provide a competitive positioning of business initiatives like cycle time reduction, implementation, implementing redesigned cross- functional processes.

Information sharing between partners in the supply chain is also crucial and these integration attempts are accompanied by IT initiatives. Such IT initiatives include:

- Use of bar-coding in logistics systems
- Use of EDI to communicate between branches
- Use of Material Requirements Planning

- Enterprise Solutions like ERP
- Internet and Web Services for communication between partners.

Given the complexity of the supply chain, with multiple participants, there is ample opportunity to increase efficiency and reduce costs by companies, which enables integration of the increasingly tighter links in the supply chain. The efficient usage of impecation (IT) in transportation and logistics distribution could provide:

- transportation management, including optimising the choice of carriers based on service requirements and freight rates;
- logistics management, including the tracking of containers from the port of origin to the port of unloading in Algeria, on the rail track and between origin and the final destination and flexible routing, storage and distribution as necessary;
- trade and transportation documentation, including the electronic development and transfer of shipping documents, customs clearance and other regulatory requirements;
- international trade finance;
- insurance.(Nitty. H. K. . AND Nolila. M. N. (2009))

Fedar Brookman and Jakobus Smit and A.j. Gillert Silvius.(2012) reported an extensive literature review from articles published since 2004 and proposed a classification scheme for the role of IT in SCM. In this scheme the researcher identified six major categories that focus on developing an IT. The model consists of the six defined categories strategic planning, Virtual Enterprise, Infrastructure, Knowledge and IT Management, Implementation of IT.

J. harharia and Shanker (2004) elaborated on this study and specified the domains into enablers. In their study they identified ten enablers and measured the what extent and enablers is a driver for IT enabled SCM.

This results in shown in table 1

Rank	Enabler	Mean	STDV
1	Supply chain wide IT strategy	3.64	1.03
2	Profit sharing due tail enablement	3.29	1.16
3	High level of supply chain integration	3.05	1.32
4	Top management commitment	2.91	1.18
5	Security of online information	2.81	1.27
6	Trust in supply chain linkages	2.73	1.19
7	Collaborative planning	2.71	1.26
8	Reliable for IT enablement	2.63	1.14

9	Funds for IT enablement	2.53	1.37
10	Awareness about use of IT in supply chain	2.47	1.27

Table 1. identified enablers of an IT-enabled supply chain (Jharkharia and Shankar 2004)

Transportation and logistics processes in the supply chain management

Organization of transport and logistics processes within the supply chain management, based on consideration of the entire logical chain, which includes all businesses, combined with information technology tools. Advance the concept of market trends, a significant potential can be increased. The driving force is the rate of change in a certain area of the economy, including transport. Several flows should be managed to accomplish the transportation operations (Lumsden, 2007). One flow is the resource flow, including internal resources such as forklifts, pallets or other load units and external resources such as vehicles, containers, etc

The union of all businesses in the logical chain contains information on all activities that occur within this chain, from forecasting customer needs, distribution of orders and ending with shipment. This facilitates the interaction of all the major logistical problems, namely the supply-production distribution transportation.

The Fig. 1 below shows how the chain is using logistic information

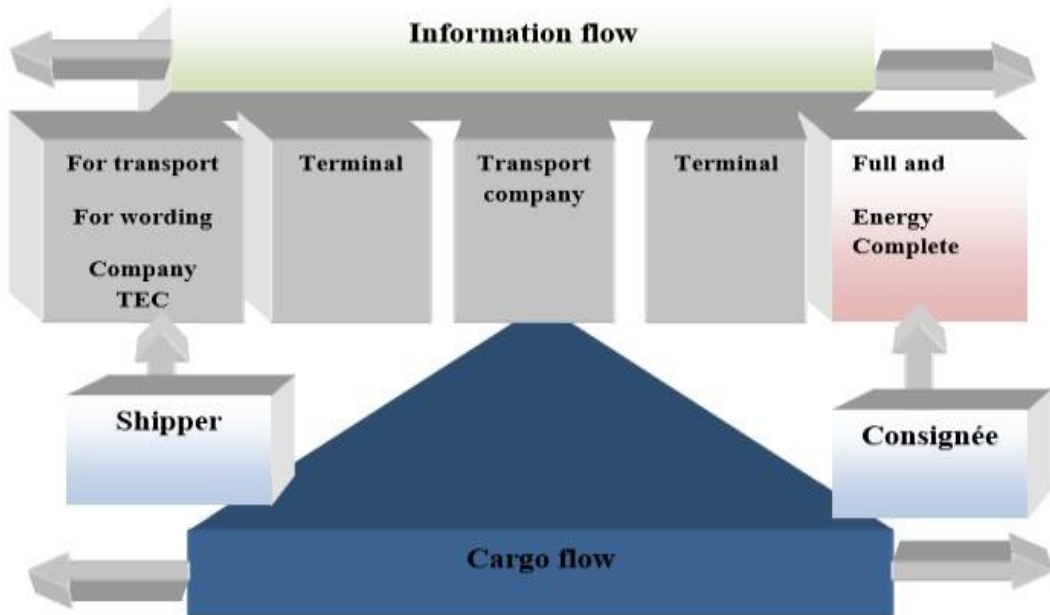


Fig. 1. Cargo and information flows in the transport chain

IT in SCM enables great opportunities, ranging from direct operational benefits to the creation of strategic advantage. It changes industry structures and even the rules

of competition. IT is key in supporting companies creating strategic advantage by enabling centralized strategic planning with day-to-day centralized operations.

The main indicator of the development of SCM is the growth of information networks. For the successful use of logistics information required to locate in the chain of communication networks, focused on logistics processes. Information and communication networks form the basis for the integration of long freight information, commodity flows. Here, for example, the use of Internet technology has a great impact on reducing delivery times. Consider the example of some company A, DLC equipment manufacturer, which could reduce the delivery time up to several days, and the replenishment time from 60 to 8 days. The use of integrated information systems can achieve significant economic benefits:

- may reduce the buffers to 20 or even 50%!
- may decrease the duration of production cycles to 50%; profit rises 30%, while costs are reduced by 20%.

And this is just one example of thousands of possible showing in practice the real possibilities of the enterprise by using the selected method. (Olga ZHURAVLEVA 2013).

Use of specific software systems for transport and logistics management

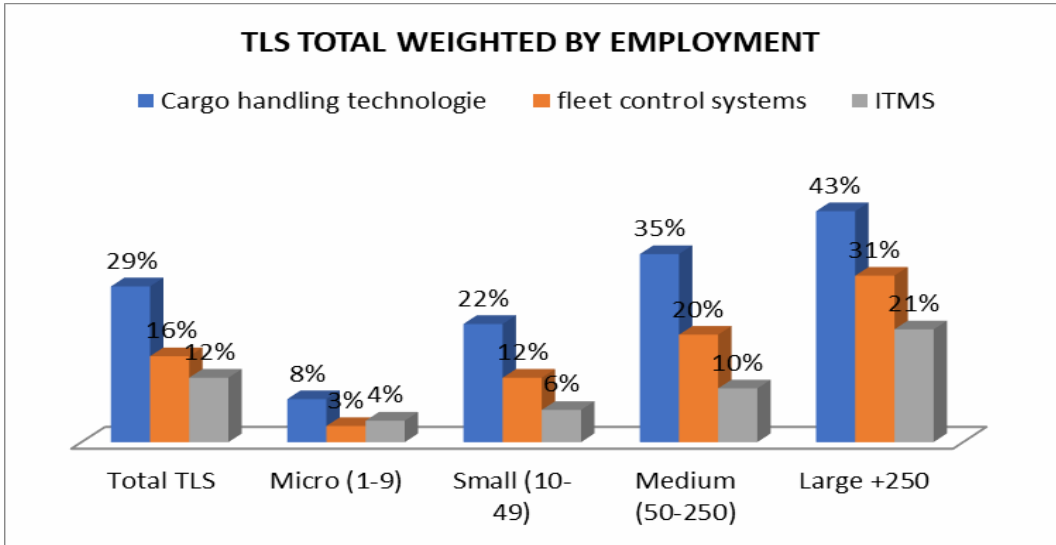
ICT are considered as a primary enabling tool for having safe and efficient operations of the transportation (Giannopoulos, 2004).

Different information and communication applications in the field of transportation have focused on applications and services designed to support the integration of the transportation and to support intermodal transportation through the transportation network. Function is a specific process, action or task that a system is able to perform (Giannopoulos G. A. (2004).

Specific software solutions for the transport sector, such as production, cargo handling technology, fleet control system and ITMS (intermodal transportation management systems) are also mostly used by large transport and logistics companies.

For example only about 20% of the small firms reported that they used fleet control systems, but diffusion increases to about 35% of medium-sized enterprises and 43% of large firms.

The pattern is similar for cargo handling technology and ITMS (intermodal transportation management systems).



Figures for TLS total weighted by employment.

Development and Application of information technology (IT) in different aspects of logistics.

The rapid development of modern logistics used platform based on the information technology is the results from few things. Information technology is a simple, cheap and secure solution. Internet of Things can go beyond it because can provide accurate flow of information of products in market to provide a reliable basis for logistics market analysis, forecasting and decision-making.

Table 1.1 Application of IT in different aspects of logistics

Activities/aspects	IT application Areas	Benefits
Transportation	Fleet management-car tracking, driver management, speed management, fuel management and health & safety management, route management.	Recovery of stolen vehicles Increase in personal safety and security Reduction in insurance costs Decrease in unnecessary over time Increased customer satisfaction
Warehousing	Warehouse management- Receive goods Identify the goods Dispatch goods to storage Pick goods Dispatch shipment	Reduction in paper work Real time dispatch Time saving in locating of inventory Increase of safety and security of goods Cargo consolidation

Custom clearance	Documentation, duty payment, inspection,	Increased customer satisfaction Reduced paperwork in clearance Reduced administrative costs Enhancing compliance with KRA
Cargo management	Container leasing, cargo security, loading and offloading,	Improved security and safety Real time cargo tracking Cargo documentation

(Source: Macharia N. W. et al 2015)

The table above highlights activities that logistics firms engage in, the areas that IT is applied and the benefit of using IT in respective areas. Under the IT application areas in logistics, it has provided the following systems: fleet management systems such as GSM/GPRS network, GPS satellites and real time fuel management system, warehouse management systems, cargo management systems such as handling systems and GPS, GSM/GPRS cargo tracking systems and communication and information systems such as EDI (Macharia N W et al (2015).

Due to technological advancement, the logistics firms have been provided with the opportunity to embrace the above systems in the management of their aspects (Sullivan, 2005). The increasing emphasis of logistics is creating focus on the use of information technology by the firms. Cost reduction focus can become intense as companies continue to adopt use of information technology to leverage competitive advantages and increase efficiency and effectiveness to enhance their profitability, market share and customer satisfaction . Logistics managers therefore need to understand the benefit of technology to enable them align information technology with business strategies to be able to make informed business decision.

Research Design

The study used descriptive survey method is appropriate. Research design is defined as a plan, structure and strategy of investigation conceived to obtain answers to research questions and control variance According to Orodho (2008), research design refers to all the procedures selected by a researcher for studying a particular set of questions or hypotheses. He summarizes it as a programme to guide the researcher in collecting, analyzing and interpreting observed facts. A descriptive survey is a method of collecting information by interviewing or administering a questionnaire to a sample of individuals (Orodho, 2009).

states that descriptive studies are not only restricted to facts finding, but might often results in the formulation of important principles of knowledge and solution to significant problems. This design was therefore, adopted for this study as it enabled the researcher to obtain a cross-referencing data and some independent confirmation of data, as well as arrange of options.

The main respondents were the Procurement and Transportation participants who were mainly involved in the company activities such as the vehicle Transport service, The Equipment Department ,The Inventory Management service , and Service Materiel and most of these respondents have Internet connections. The participants were regarded as a representative sample of the MPOI participants being involved in Internet-based activities. Only a few repair workshops that have an Internet access were included in this study to represent participants from the upstream activities. A small number of participants who were thought to be non-Internet users were also included. After making a careful selection of these the vehicle Transport service participants whose addresses were gathered from several regional directorate and departement of transportation ; Table 2 shows the number of the target respondents based on their usage of the Internet and information technology (IT).

Table 3 No of target respondents by internet and information technology (IT) usage

Target Respondent	Number in Sample
The vehicle Transport departement	15
The Equipment Department	10
The Inventory Management department	9
The Procurement department	6
Non Internet and information technology users	
The vehicle Transport departement	2
The Equipment Department	2
The Inventory Management department	1
The Procurement department	0

To achieve the validity of this study , a pilot survey was carried out where answers to research questions were sent to different laborers of company before the actual survey was carried out. The purpose of conducting the pilot survey is to ascertain feedback and information from the respondents and to scrutinize the weakness of the questions so as to increase the validity of the study. In the actual survey, interview questions were we have been interviewed 45 workers . A total of 45 (%) completed interview question were eventually and used for the analyses. The data were analysed using descriptive statistics including frequencies, mean, and standard.

Analysis and Discussion

The result from the questionnaire survey reveals that 40 (89 %) of the respondents have used the Internet whereas 9 (11 %) of the respondents have not (Figure 2).

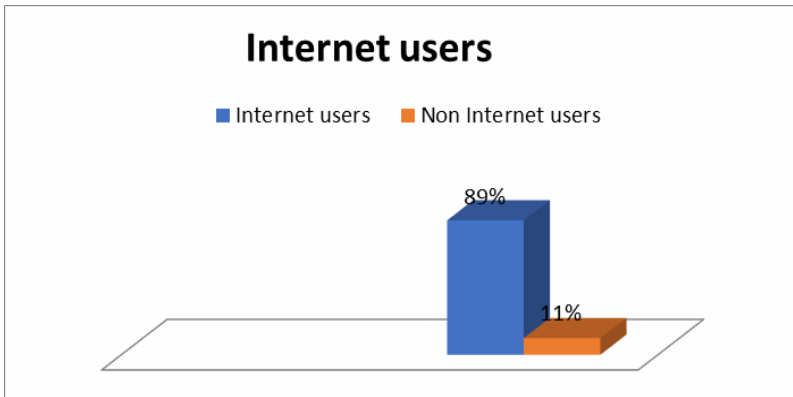


Figure 2 Internet Users

All the Internet users (40 Employees) utilized e-mail to communicate with their clients and counterpart (Table 3). From the same table, The result also indicates that only 30 employees of this companies have intranet facilities however none of them were connected to an extranet.

According to Lockett and Brown (2001) classified the complexity of Internet applications into five categories namely very low, low, medium, high and very high complexity. The classification explains a low level of complexity corresponds to basic Internet users whereas a high level of complexity requires advanced Internet users. This study uses only three categories namely low, medium, and high complexity as shown in Table 3. Most of the MPOI participants (40 employees) in this study were low-level users who used basic Internet applications such as e-mails, web sites and Intranet for their business activities. 7 employees were categorized as medium-level Internet users while 3 employees were high-level users who used more complex applications such as online order monitoring systems, and e-procurement.

Table 3 Types and level of internet application complexity.

Types of Application	Level of Application complexity	Utilize	Non utilize
E-Mail	Low	40	
Intranet	Low	30	10
Third Party Website	Medium	12	28
Internet EDI	Medium	5	35
Extranet	Medium	0	40
E-Banking		2	38
Online Order Monitoring System	High	2	38
E-Procurement	High	1	39

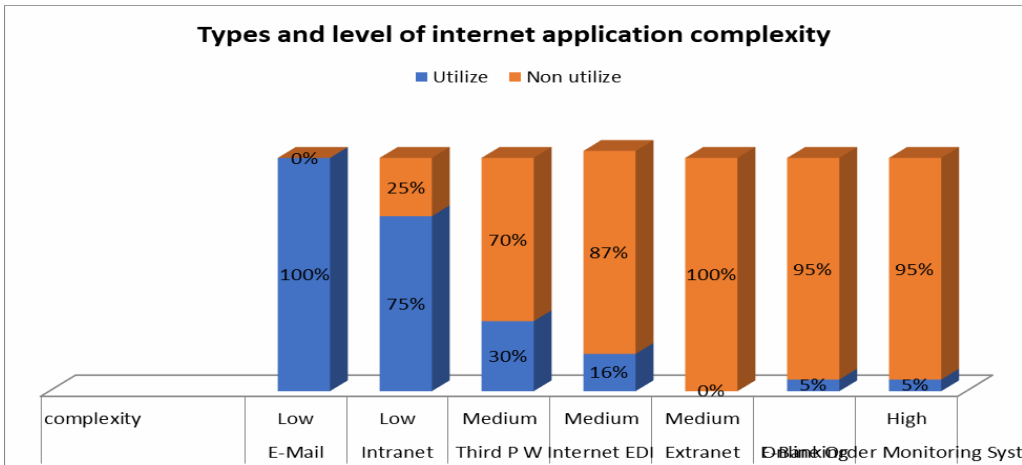


Figure 3. Types and level of internet application complexity.

Conclusion

Logistics is inconceivable without the active use of information technology. It is impossible to imagine the formation and organization of the chain of delivery of goods without intensive rapid exchange of information between participants in the transport process, without the capacity for rapid response to market demand for transport services.

Large enterprises, especially those related to international companies, among the first to feel the need to introduce information technology in management of production processes. Competition in the market of production and transport services in connection with the emergence of many small private companies.

this study concludes that to achieve the efficiency and effectiveness in logistics activities, the employees would need to adopt and implement advanced Internet technologies and encourage other department of company to make the same effort.

With the support by all participants, the employees of company would increase its competitiveness and be at par with other company of petrol and pape industries. Intensive support from the Government of Algerie to promote and encourage companies to adopt Internet technologies would help the petrol oil industry participants to achieve a better level of adoption. This is a key way to maintain long-term survival of the business operations.

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