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Factors Influencing the Adoption of Information Communication Technology (ICT) in Logistics and Freight Transportation Sector in Mombasa, Kenya

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Abstract: **Information Communication Technology (ICT) has emerged as a very important key success factor in the success of logistics and freight transport sector. Many local firms in this sector have risen to the challenge and began to implement this technology to enhance their competitiveness. However, not much had been researched on this concept from a Kenyan perspective. The aim of this study therefore was to establish the factors influencing the adoption of ICT in the logistics and freight transport sector. The study was carried out in Mombasa and targeted employees of selected companies in the maritime sector. Descriptive research design was used to conduct the study. Proportionate stratified sampling was employed to select the sample from the population. Data was collected using questionnaires which were issued to various staff of freight companies. Data was analysed using SPSS and the findings indicate that there is a significant relationship between the independent variables and the dependent variable.**

Keywords: **ICT, Freight, Logistics, Infrastructure, Supply-chain.**

I. INTRODUCTION

Freight transportation has progressively developed into a dominant issue facing logistics processes today. It represents a major cost item – transportation costs vary from around 25 percent (Lancioni et al., 2000) to upwards of 50 per cent of overall logistics costs (Swenseth and Godfrey, 2002), depending on the source – and it is also a key factor in providing good customer service affecting delivery punctuality, timeliness, accuracy and the ability to offer tracking information.

The process of freight transportation is marked by significant complexity, as it includes a variety of players (Crainic and Laporte, 1997), each with its own particular characteristics and requirements. The framework as a whole comprises structured third-party logistics service providers (3PLs), couriers and express couriers, small transportation companies, multi-modal transport operators, rail and sea carriers, as well as dispatchers and receivers – not to mention port and inter-modal terminal infrastructures. This eco-system of intertwined players requires complex information networks and managerial procedures to work as a coherent unit in the eyes of the final customer. And when it fails to do so, the consequences are higher costs and poor service performance.

Over the past few years, the transportation industry has experienced increased competitiveness (Bowersox and Daugherty, 1995; Davies et al., 2007). In the first place, new international players have entered the competitive arena thanks to ever-increasing globalisation and internationalisation (Lemoine and Dagnæs, 2003). Moreover, players consider leading factors like cost compression and service level when choosing their providers. Lastly, environmental concerns (e.g. reduction of traffic congestion and improvement of safety and security requirements) have taken on renewed importance (Bander et al., 1998; Loebbecke and Powell, 1998).

In this scenario, i.e. increasing complexity of logistics and transportation networks and stronger competition on costs and service performance – information and communication technology (ICT)-based applications could be seen as a primary

key enabler (Bowersox and Closs, 1996; Closs et al., 1997; Bharadwaj, 2000; Spanos et al., 2002; Golob and Regan, 2002a; Giannopoulos, 2004). Following Marchet et al. (2009), the main types of ICT applications available for logistics and freight transportation companies can be classified differently. First, transportation management (TM) applications, i.e. according to Mason et al. (2003), decision support tools in transportation planning, optimisation and execution, with typical functionalities including carrier load tendering, routing and scheduling, shipment tracking and tracing, and freight payment and auditing (Gilmore and Tompkins, 2000; Tyan et al., 2003). Second, supply chain execution (SCE) applications, designed to manage and automate information exchange and real-time management during the actual execution of a distribution schedule (Giaglis et al., 2004). Third field force automation (FFA) applications, enabled by mobile technology and supporting the integration between remote workforce and corporate business processes (Rodina et al., 2003). Fourth, fleet and freight management (FFM) applications, mostly being used both as reporting tools by logistics managers who need to know vehicle travel times, service times, delivery points visited and other parameters (e.g. load temperature), and as real-time input to dynamic vehicle management functions to efficiently manage a fleet of vehicles during the execution of distribution plans.

II. STATEMENT OF THE PROBLEM

From both the practitioner and the research community perspective, the topic of ICT to support logistics and freight transportation processes has brought about growing interest. Indeed, many contributions on this theme can be found in the extant literature, sometimes under the label "intelligent transportation systems" (ITS) (Wootton et al., 1995; Levia¨kangas and La¨hesmaa, 2002; Iguchi, 2003; Panou and Bekiaris, 2004).

However, there are yet a surprisingly low number of studies addressing the level of adoption and many focus on the public transportation field alone (Cohen et al., 2002; Giannopoulos, 2004). It is nonetheless interesting to note that those papers assuming a "private" (i.e. company) perspective have progressively increased, thereby exposing the need to call attention to ICT suitability and profitability within companies that carry out freight transportation activities.

To the best of the authors' knowledge, there is no literature review on the role of ICT in logistics and transportation taking the company perspective from a developing country perspective as in Africa. However, in Mombasa in Kenya for example, the logistics and freight transportation sector is quite developed and has continued to adopt these technologies. This study therefore is set out to investigate the factors influencing the adoption of ICT in the logistics and freight transportation sector in Mombasa.

Objectives of the study:

The overall objective was to establish the factors influencing the adoption of ICT technologies in the logistics and freight transportation sector in Mombasa

Specific Objectives:

1. To establish whether the desire to reduce costs influences the adoption of ICT technologies in the logistics and freight transportation sector in Mombasa.
2. To establish whether the desire to improve customer service levels influences the adoption of ICT technologies in the logistics and freight transportation sector in Mombasa.
3. To establish whether the desire achieve process control influences the adoption of ICT technologies in the logistics and freight transportation sector in Mombasa.
4. To establish whether the desire to enhance monitoring of operations influences the adoption of ICT technologies in the logistics and freight transportation sector in Mombasa.

III. THEORETICAL FRAMEWORK

There are several theories that relate to adoption of technology which are explained below.

(1) Technology Acceptance Model (TAM):

Technology acceptance model is one of the major models explaining how users accept and use technology. It indicates that users of technology are mostly influenced by two factors, which include perceived usefulness and the perceived ease of use. Perceived usefulness means the level to which a user believes that using a system will improve his job performance. Perceived ease of use is the level to which a user believes that using a certain system would be effort-free.

These two aspects determine the pace and level in which an individual or an organization would be willing to adopt a certain system or technology for their use (Davis, 1989).

(2) Unified Theory of Acceptance and Use of Technology (UTAUT):

It is a model for acceptance of technology which explains the intentions of the user to use information systems and subsequent usage behaviour. The theory indicates that there are four major factors including facilitating conditions, effort expectancy, performance expectancy and social influence. Facilitating conditions determine user behaviour while the other three directly determine usage intention and behaviour (Venkatesh, Michael, Davis and Fred, 2003)

(3) Diffusion of Innovations (DOI):

This theory explains how, why and at what rate new ideas and technology spread. Diffusion is described as the process through which innovation is communicated over a period of time among the participants in a social system. The main factors influencing the spread of a new idea include the social systems, time, the innovation itself and communication channels. This theory divides the adopters into five categories including innovators, early adopters, early majority, late majority and laggards. The degree by which an individual or organization adopts a new idea or technology is affected by the type of adopters and innovation-decision process (Everett, 2003).

IV. METHODOLOGY

The study adopted a descriptive survey research as it enables the identification and classification of the elements or characteristics of the subject. According to Cooper and Schindler (2003), a descriptive study attempts to describe or define a subject, often by creating a profile of a group of problems, people, or events, through the collection of data and tabulation of the frequencies on research variables or their interaction. A sample of employees of all levels in freight companies was selected through stratified sampling technique. Descriptive statistical techniques including Minimum, Maximum, Mean and Standard Deviation were used to analyze data. The association between the dependent variable and the independent variables were determined by the use of the Pearson correlation coefficient that determines a linear relationship between two variables.

V. ANALYSIS AND CONCLUSION

Table 1: Correlation Analysis of the Factors Influencing Adoption of ICT

	Adoption	Cost	Service	Process	Monitoring
Adoption	1	0.515	0.719	0.627	0.458
Cost		1	0.135	0.151	0.132
Service			1	0.548	0450
Process				1	0.295
Monitoring					1
N					

* Correlation is significant at the 0.05 level (2-tailed).

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

Analysis shows that there is a positive relationship between the desire to reduce cost and desire to achieve process control of 0.151. There is also a positive relationship between desire to improve customer service levels and achieving process control of 0.548. There is a positive relationship between desire to improve customer service levels and desire to enhance monitoring levels of 0.450. There is a positive relationship between desire to enhance monitoring levels and desire to achieve process control of 0.295. There is a significant positive relationship between the dependent variable adoption of ICT and independent variables desire to reduce cost (0.515), desire to improve customer service (0.719), desire to achieve process control (0.627) and desire to enhance monitoring levels (0.458). The researcher therefore concluded that desire to reduce cost, desire to improve customer service, desire to achieve process control and desire to enhance monitoring levels influence how the organization adopts information communication technology.

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