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LEVERAGING TELEMATICS FOR OPTIMAL FLEET PERFORMANCE

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ABSTRACT

This study aimed at evaluating the effectiveness of a modern fleet management system implemented in Kenya Power & Lighting Company, a utility firm in power distribution to improve the logistics of transporting staff, goods and materials. Fleet operations are increasingly turning to vehicle telematics systems to boost profitability, productivity and operational efficiencies. The vehicle telematics also known as a GPS fleet management system or GPS vehicle tracking system combines a GPS receiver and an electronic GSM device installed in each vehicle, which then communicates with the user and web-based software which provides monitoring of the vehicle location, movements and status of a vehicle or fleet of vehicles. Evidence of companies reducing costs, eliminating inefficiencies and locating lost equipment are making telematics an attractive investment for transport business owners. The study employed the mixed methods research to provide a better understanding of the research problem by use both quantitative and qualitative approach in data collection. The research findings show a positive impact on the delivery of transport services at reduced operational cost after the adoption of the GPS enabled fleet management system in the company transport operations.

Keywords: Telematics, Global positioning system, Information and communication technologies, Fleet management system, Global system for mobile communications, Intelligent transport systems. **Nature of contribution** – Management Innovations - empirical study based on survey research methodology amplifying the use of business intelligence, communication, and productivity in business applications.

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Contribution/ Originality:

The paper's primary contribution is finding the effect of modern IT solutions on the transport logistics processes and possible improvement in fleet operational performance. This study contributes in the existing literature on real-time IT logistics technology whilst providing the necessary impetus for more research in areas which are not well-researched.

1. INTRODUCTION

The application of on-board telematics is indispensable modern fleet management tools that offer systems for saving money and maximizing delivery and operation efficiencies. Telematics can help solve supply chain issues, better coordinate deliveries and create an overall more profitable and smoother operating fleet that provides fleet managers and drivers with real-time information that helps entire fleets operate more efficiently and safely. This new level of fleet efficiency translates into competitive advantage. Transport and logistics sector underpins the economy, enabling the efficient movement of goods, services and people.

The heart of economic and social expectations lays in calls for economically effective and the safest possible solutions to the issues of the mobility of people and goods. Modern telematics and ICT systems provide a chance for improving both the security and safety as well as effectiveness of road transport. Intensive global economic development in logistics like Just-In-Time, using less storage and more frequent deliveries creates new challenges for transport systems and have put more pressure on the transport market, which has been characterized by an increase in the importance of time, speed, and reliability on transport operations leading to a higher dependence on road transport (Golicic *et al.*, 2010). The increase in the concomitant management requirements of vehicle fleet operations has outweighed the human mental capacity as advances in the technology of vehicular dynamics and design increase year after year. Similarly, logistics strategies moving from decentralized to centralized distribution systems in companies' logistics set-up have also contributed to increased transport work in general (Kohn and Brodin, 2008).

In modern times and the realities of the market economy, information is considered increasingly as the one of the most important factors in the proper management and operation of the company (Dima *et al.*, 2010). At the same time, in contrast to the past, present progress and technological development allows for almost continuous acquisition of information, its rapid transmission and reception, but causes the phenomenon of information "flood". Currently, the role of the information, that it performs not only in the company but also in its environment, and its impact on business operations, causes that it to be a kind of company's nervous system, entwining their network all departments, divisions, subsidiaries, affiliates or employees.

Fleet Telematics in its broadest context, includes system hardware, software and operation and communication protocols. The term "telematics", is a combination of two words: "telecommunications" and "information technology", and in accordance with the definition given by the New Encyclopedia of Universal means telecommunications department dealing with the

transfer, exchange or dissemination of information in the form of immovable property picture of alphanumeric text, logos, writing, drawings or photographs (Kot, 2008). A telematics system, also known as a GPS fleet management system or GPS vehicle tracking system, is a rapidly growing technology that has evolved significantly in the past decade. Telematics also means telecommunications solutions, computer and information and automatic control solutions used to meet the needs of supported physical systems - resulting from their jobs, infrastructure, organization, processes, maintenance and management - and integrated with those systems (Smarandache and Vlăduţescu, 2014).

Evidence of companies reducing costs, eliminating inefficiencies and locating lost equipment are making telematics an attractive investment for business owners. Telematics technology is the key to maximizing efficiencies and mitigating excess expenses by giving fully integrated real-time command and control telematics which allow operation managers to manage nearly 100% of their daily use of transport assets. In common usage telematics means devices and systems collecting data for the transmission of their distance using telematics and transform them into information for the final user (Traistaru, 2013).

In many organizations the use of GPS enabled fleet management systems is growing due to its crucial role in the present knowledge-based economy which relys heavily on ICT solutions in order to develop and grow their businesses (Asgarkhani and Young, 2010). The telematics system in transportation has to do with the sending, receiving and reservation of information through the telecommunication and devices as well as control of the objects in distance. The Global Position System is the main technologies that is included in the system discussed on this article and that can be called differently vehicle telematics.

While studies concerning the technical aspects of vehicle telematics using a global positioning system (GPS) have been conducted in developed countries in Europe and America (Stopher *et al*., 2007), very little information is available on the use of modern fleet management systems in developing counties like Kenya where general transport systems are not well developed. The only readily available information is from the marketing sources for various fleet tracking equipment and software systems.

In Smithsonian Institution (Thi, 2011) which operates a widely diverse fleet of 1,500 vehicles to support its operations in more than 80 countries around the world, through the use of a fleet management information system and telematics (which combines GPS tracking and information networking), the Smithsonian was able to meet its organizational targets and achieve important benefits in optimizing the size of their fleets and increasing vehicle utilization.

The use of information and communication technologies ICT in order to gain a competitive advantage has become a key strategic issue in organisations in a fast globalising environment particularly as a result of the fact that ICT plays a strategic role in the management of organisations. Rastrict and Corner (2010), among others, emphasise the positive relationship

between ICT and its benefits. To run the transport process smoothly, companies are increasingly using modern tools of information systems.

According to Marchet *et al.* (2006) categorisation of the main GPS enabled fleet applications for freight transportation companies in terms of three application types:

a) Transportation fleet and freight management;

b) Supply chain execution; and

c) Field force automation.

De Jong *et al.* (2006) conducted a survey on the perceptions of users of the effects of new technologies on urban distribution systems performance. The survey found that the use of modern fleet management systems is expected to reduce the share of empty and not fully loaded vehicles and consequently increasing economic efficiency in freight transportation service. The revolution in the use of ICT has profound implications for both economic and social development and has, in fact, pervaded every aspect of human life. The application of ICT is widespread as it is regarded as an essential tool in the efficient administration of any organisation and the delivery of services to clients (Shanker, 2008).

According to a fleet management consultancy in Kenya (Okuttah, 2009), technology offers an answer to the business operational challenges being experienced in Kenya, including motor vehicle theft, fuel siphoning or loss of goods in transit. Kenyan entrepreneurs have found these systems particularly useful for the purpose of fleet management in the wake of increasing fuel theft and fuel adulteration in the market. Three versions of technology-based tracking systems are available in East Africa, namely those that rely on a mix of GPS and Global system for mobile communications (GSM) systems, radio frequency systems and satellite-based platforms. The GPS/GSM tracking system is the most common in Kenya and it is priced at approximately US$500 for complete installation in a vehicle.

With the introduction of mobile, vehicle, laptop, wildlife and personal tracking, it is now easier than ever to recover stolen goods (Karen, 2010). GPS enabled fleet management systems can allow for improved scheduling, real-time employee timesheet monitoring and in-the-field customer invoicing, all of which further reduce drive times. GPS enabled fleet management systems also perform fleet analytics and record historical data, which help fleet managers to understand and address any outliers (Prockl *et al.*, 2011).

To establish the impact of the implemented fleet telematics in the transport processes, the following specific questions served as a guideline for studying the research objective:-

- What is the effect of GPS in reducing road accidents?
- What is the effect of GPS in increasing fleet availability?
- What is the effect of GPS in reducing the fleet operations costs?
- What is the effect of GPS in minimising the theft of vehicles?

2. RESEARCH STRATEGY

The key performance variables crucial in examining the contribution of the GPS-enabled solutions to the organizations were important objectives in this study and are stated again below:-

- What is the effect of GPS in reducing road accidents?
- What is the effect of GPS in increasing fleet availability?
- What is the effect of GPS in reducing the fleet operations costs?
- What is the effect of GPS in minimising the theft of vehicles?

This research therefore employed the quantitative method based on the deductive reasoning approach. The deductive reasoning approach was deemed appropriate for studying the phenomenon in question and for describing the nature of the effects and consequences identified. The adopted research design explains the significant implications of the type of data collection methods and analyses to the research findings (Kothari, 2005).

2.1. Determining Sample Size for the Research

The sampling procedure of one-stage cluster sampling (Henry, 1990) and the use of the simple random sampling technique (Kish, 1965) were applied for selecting elements from the research population. According to the guide to minimum sample size by Krejcie and Morgan (1970), a population of 1 200 require a sample size of at least 291 units. The company fleet fitted with GPS-enabled units was distributed to ten geographical branches of the company business operations and supervised by the respective transport officers, and therefore a total sample of 349 units drawn from three different geographical branches was deemed sufficiently representative of the whole fleet. The cluster sampling, also called block-sampling method (Henry, 1990), was adopted for determining the particular clusters from the regional branches that are as representative as possible of the population. The sampling numbers were generated with the StatTrek's random number generator (StatTrek, 2012). This system uses a statistical algorithm and was to select three clusters that were representative of the whole population. Clustering the transport branches as they were distributed was done and then three out of the ten KPLC company regional branches were selected to give a sufficient representative sample for the research through the cluster sampling procedure.

2.2. Data Collection Techniques and Instruments

The research adopted a survey strategy to provide the necessary techniques and instruments to enable the collection of data, which would allow an in-depth examination while gathering information that would explain the relationships between constructs, in particular, cause-and-effect relationships through statistical inference (Katz, 1982). Survey data was collected using a structured questionnaire anchored in a five-point Likert-type scale. "Statistical inference can be defined as the use of sample data in order to form general conclusions regarding a population" (Katz, 1982).

The survey questionnaire was structured to obtain demographic, direct and motivated responses. The research participants were encouraged to provide substantiating comments to support their responses. The information from the respondents was crucial in examining the contribution of the GPS-enabled solutions to the organisations under study. The data collected was based on the key variables crucial in examining the contribution of the GPS-enabled solutions to the organisations under study.

2.3. Data Analysis and Interpretation Methods

Three hundred and thirty-four respondents of the total of 349 from the three sampled areas responded in good time and all the questionnaires were edited and checked for completeness for use in the data analysis. Bazeley (2002) states, "Coding or categorising of data is undertaken to facilitate understanding and retrieval of information". All the research findings from the field were first put into categories and coded according to the themes to assist in review of the numerous research variables contained in the questionnaires. The classified data was then presented in figures, tables and charts according to the research objectives for ease of interpretation, understanding, reading and discussion.

The study intentionally employed the mixed methods research to provide a better understanding of the research problem by use both quantitative and qualitative data and the combination of the strengths of each to answer research questions. Quantitative (mainly deductive) methods are ideal for measuring pervasiveness of "known" phenomena and central patterns of association, including inferences of causality. Qualitative (mainly inductive) methods allow for identification of previously unknown processes, explanations of why and how phenomena occur, and the range of their effects Pasick *et al.* (2009).

The quantitative data for this research was collected and correlated using the deductive reasoning approach, since it was appropriate for studying the phenomenon, and the article describes clearly the nature of the consequences identified by the research objective. The descriptive research approach adopted allowed in-depth examination while gathering information that explained the relationships between constructs, in particular cause and effect relationships, by means of statistical inference.

The primary data from this research and secondary data collected from KPLC archived and recorded data were analysed using the content analysis method. Content analysis is an objective, systematic, quantitative and reliable method for the research of published information (Ellinger *et al.*, 2003) and also for measuring comparative positions and trends in reporting (Kent and Flint, 1997). The technique is applied systematically and with proper controls, such as definite explorations of the variables to be analysed in order to yield appropriate levels of validity and reliability (Kolbe and Burnett, 1991). It also helps to avoid the element of subjectivity inherent in content analysis (Peterson, 1998).

The descriptive technique and content analysis method were the two methods of data analysis adopted in this research to enhance understanding for the accurate and concise presentation of the results obtained in a way that answered the research questions. According to Bazeley (2002), the use of a mixed data analysis approach enriches the understanding of an experience or issue through a confirmation of conclusions, extension of knowledge or by initiating new ways of thinking about the subject of the research.

Coding or categorising of data was undertaken to facilitate understanding retrieved information (Hay, 2005). However, it was necessary to analyse the combined data further so as to establish the total effect on the key variables. Descriptive statistics and correlations based on the characteristics and frequency distribution were employed in the research to analyse the resultant effect on the key variables. The content analysis method was used so as to ensure the reliability of the research of published information (Ellinger *et al*., 2003) and also for measuring comparative positions and trends in reporting (Kent and Flint, 1997).

The analysis carried out on the data collected from the respondents in the three clusters randomly selected for sampling provided valuable understanding and possible answers to the research questions as discussed further in the next subsection.

3. DISCUSSION ON FINDINGS

The research focused on determining whether the GPS-enabled solutions improved effectiveness and efficiency in KPLC. The survey results on key variables considered in the research showed notable improvement in transport operations as discussed below:

3.1. Effect of GPS on Reducing the Rate of Accidents

In 2008, prior to the installation of a GPS enabled fleet management system in KPLC, the company had an accident rate of approximately 14 accidents per million kilometres with grievous consequences which included direct and other indirect costs. The research findings showed that the assessment and monitoring of the operators become possible through regular reports from the GPS fleet monitoring system and improved the driver's general driving habits, ensuring greater safety which, in turn, reduced the possibility of an accident happening as shown below in Figure 1.

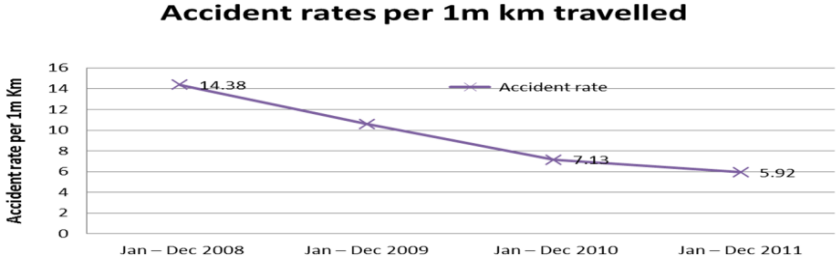

Figure-1. The effects of the GPS on the rate of accidents after GPS implementation

The survey data showed that the accident rate reduced drastically by about 59% to an average of below six accidents per million kilometres from about 14 accidents per million kilometres. This finding was corroborated by the finding of Kleodon *et al.* (1997) that a higher speed increases the likelihood of an accident. According to Kleodon *et al.* (1997) a very strong relationships have been established between speed and accident risk. These research findings compare well with the case study cited above in reinforcing the fact that the achievement realised as a result of implementing a GPS-enabled solutions in transport logistics is valid and confirms the positive effect of the system on the reduction of accidents.

3.2. Effect of the GPS in Improving Fleet Availability

The implementation of the GPS-enabled solutions was intended to mitigate its low fleet availability and failure to meet deadlines in the transportation activities as captured in the internal memo by the CEO of KPLC. The results of the research carried out in KPLC showed that enforcing speed limits and good driving habits contributed to increased productivity because of better safety and operational management decisions – an important feature of the GPS technology. There was a remarkable improvement in fleet availability from an average of 93.2 to 95.5% and this created additional vehicles available for the prompt transportation of staff and materials to various customer sites as shown below in Figure 2.

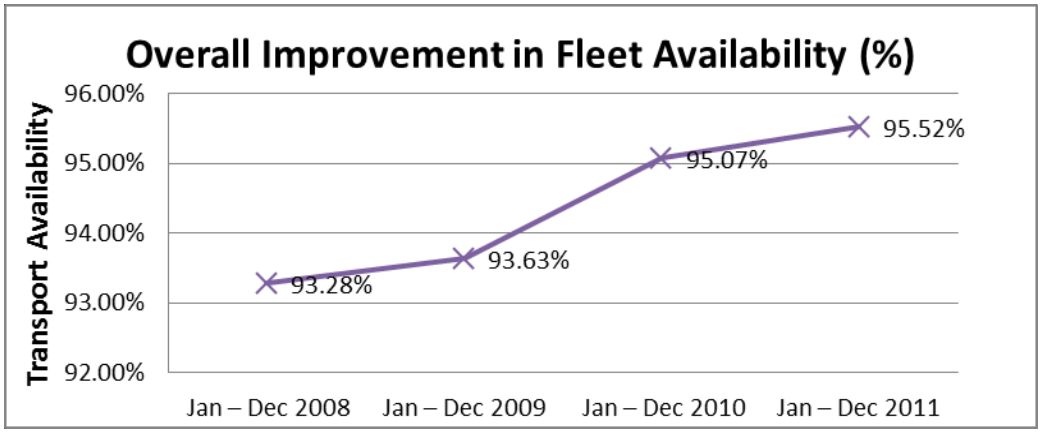

Figure-2. The fleet availability improvement after GPS implementation

The revenue generated as a result of the higher mileage covered grew by 20% from about US$4 million in 2008 to US$5 million in 2010, which is a direct financial contribution from the effect of a more efficient logistical process. The objective of improving fleet availability is one way of gaining a competitive edge by providing superior customer service with improved efficiency and closer customer and supplier relationships. The greatest advantage to KPLC has been the real-time monitoring and interaction with fleet vehicles to attain high fleet operation efficiency and provide a fast response to customer needs.

Sanders (2007) says, "GPS-generated data improves service planning and develop increased productivity because of better management decisions", and so corroborates the positive improvement in fleet availability realised after the implementation of the GPS-enabled solution. KPLC is now able to determine how fast drivers are going and the usage of any fleet vehicle through the GPS generated data for each employee which indicates exact start/end times and actual work and overtime hours. According to a case study conducted at Willard Batteries, a South African company based in Port Elisabeth (Opsi, 2007), implementation of a modern fleet management solution resulted in a vehicle utilisation improvement from 60% to over 90% (Opsi, 2007). Those results compares well with results from this study where a similar achievement of 95.5% fleet availability was recorded. Further results shows a decline by 25% in recorded cases of misuse translating to greater efficiency and effectiveness in fleet due to the implementation of GPS-enabled fleet management system.

3.3. Reducing the Fleet Operations Costs

In 2008, KPLC's overall transport expenditure on pool vehicles escalated to a peak of US$7 million annually at about 47 US cents per kilometre and a high rate of 14 accidents per million kilometres in year 2008 as shown in the company annual accounts. From the survey results the accident rate was drastically reduced to below six accidents in 2010 from about 14 accidents per million kilometres recorded in 2008 before the installation of the GPS fleet management system as shown below.

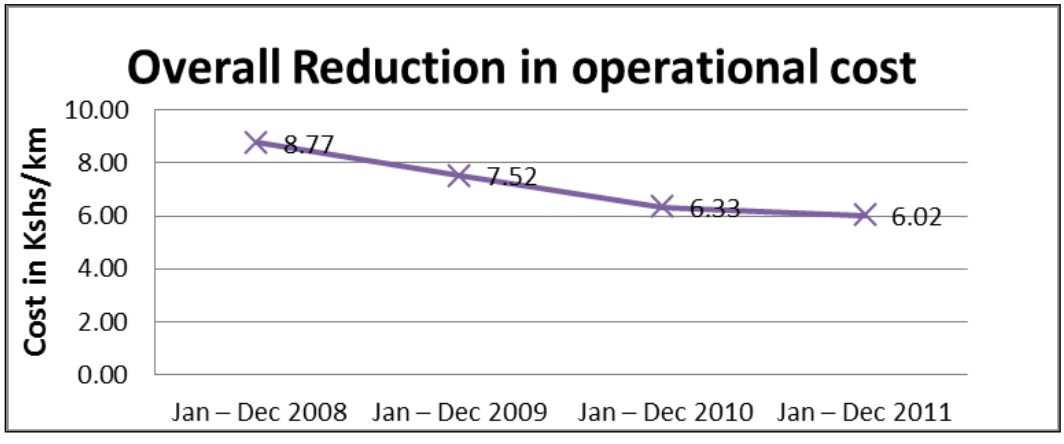

Figure-3. Reduction achieved in costs after the GPS implementation

In Figure 3 above, it shows a reduction of about 16% in maintenance costs from 9.7 US cents per km to 6.6 US cents per km, which translated into significant savings on the overall operation budget. From the study on the implementation of GPS-enabled solutions in KPLC the results show in 2010 a higher customer satisfaction levels and better resource utilisation while reducing service-related costs as opposed to 2008 before the implementation. Krishnaveni and

Meenakumari (2010) found that ICT played a major role in reducing operational inefficiency and improving decision-making in many areas of governance. Cordella (2006) emphasises that the diffusion of ICT in the present era is associated with an increased amount of information becoming available. Furthermore, Hengst and Sol (2001) affirm that ICT enables organisations to decrease costs, increase organisational capabilities and assist to shape inter-organisational coordination.

3.4. Effect of the GPS on Minimizing the Theft of Vehicles

The current research found that the implementation of GPS vehicle tracking in company fleet vehicles has increased fleet security and control. The research shows that it has acted as a deterrent to theft of company vehicles and enhanced the security of the operators, reducing the occurrence of theft from an average of six vehicles to the current less than three vehicles in a year as shown in Figure 4 below.

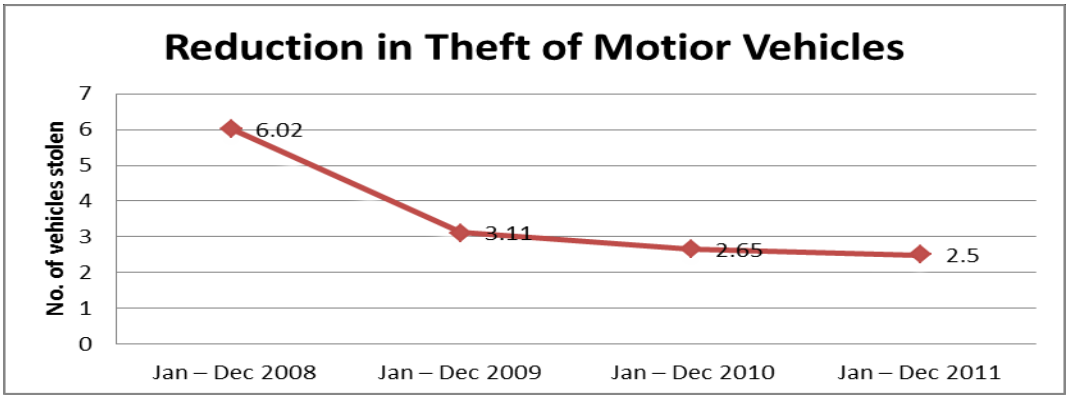

Figure-4. Reduced rate of theft of vehicles after GPS implementation

The reported cases of stolen motor vehicles and motor cycle have drastically reduced since the installation of the GPS tracking system, which provides very good chance for of any stolen vehicle being recovered. The data collected showed reduced cases of misuse or illegal journeys, resulting in more efficient resource utilization levels while controlling service-related costs. This has consequently increased the fleet availability and the efficient utilization of the fleet. The use of the GPS live tracking ability to locate lost or stolen property with exact location details and geographical positioning provides security personnel with direct assistance in the case of a stolen vehicle. The inbuilt remote shutdown function ensures the ability to disable a stolen vehicle while in operation.

According to Nietermayer (2010), "Online GPS technology allows real-time tracking and, if a vehicle is stolen, there are alerts to signal the beginning of visual tracking. Using the "ping" feature, regular updates on the stolen vehicle's location appear on the software dashboard screen on the desktop computer which may be used to disable a vehicle in operation, if necessary, in the

course of security recovery". This has enhanced the control of the KPLC fleet and the ability to recover stolen or reroute diverted vehicles and reduce the possibilities of lost or stolen vehicles.

3.5. Summary on Benefits of Adopting GPS Fleet Management System

The survey results showed an overall efficiency improvement of approximately 85% in service delivery at KPLC after implementation of modern information technology in fleet management as shown in Figure 5 below.

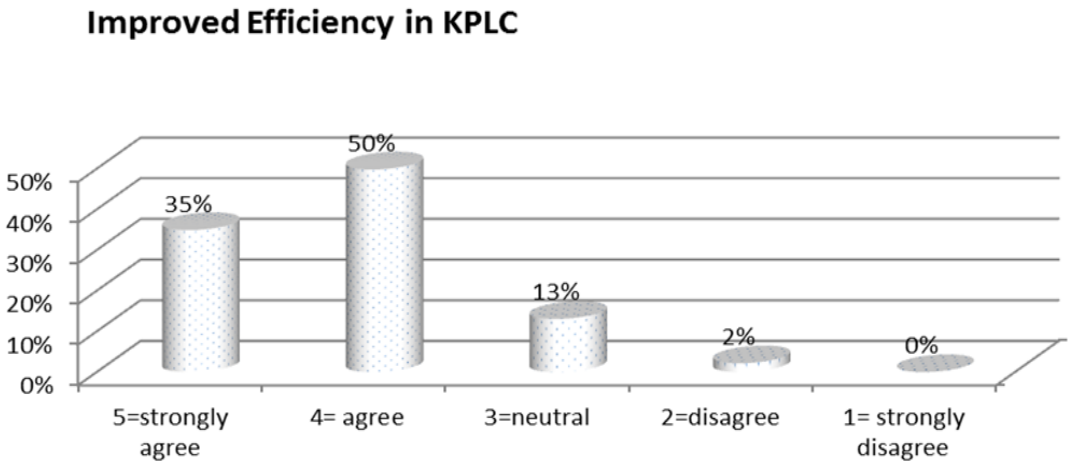

Figure-5. Improved efficiency in service delivery at KPLC after implementation

The key performance parameters analysed showed that in KPLC the following are notable improvements in the key service performance indicators since the adoption of GPS-enabled solutions in the fleet management and operations in the company:

- The accident rate was drastically reduced to below six accidents in 2010 from about 14 accidents per million kilometres recorded in 2008 before the installation of the GPS enabled fleet management system in KPLC vehicles.
- The data collected showed significant improvements of approximately 16% reduction on maintenance budget from 8.3 US cents per km in 2008 to an average of 7.0 US cents per km in 2010.
- The reported cases of stolen motor vehicles and motor cycle have drastically reduced since the installation of the GPS tracking system in KPLC vehicles between 2008 and 2010, which reflects a very good possibility of any stolen vehicle being recovered.
- The data showed reduced cases of misuse or illegal journeys resulting in more efficient resource utilisation levels while controlling service-related costs in KPLC vehicles between 2008 and 2010. This has consequently increased the fleet availability and the more efficient utilisation of the fleet.

The above results show the accrued benefits arising from the implementation of the GPS. Sanders (2007) asserts that the GPS improves service planning and results in increased productivity because of better control of fleet operations and the availability of information for management decision-making. The adoption of IT solutions in the GPS enabled fleet management system has had a very significant influence on the level of the effectiveness and efficiency in the logistics processes in KPLC.

The survey results shows that the implementation of GPS in KPLC has drastically changed transport processes by introducing electronic data handling, and the use of GPS web-based generated reports save time and human resource. Regan and O'Connor (2002) state that successful implementation of new technology within an organization is a time-consuming process involving several interplaying variables. The benefits are realized only when people are willing and able to use them". The GPS-enabled solution gives them the ability to increase their response time for customer requests regarding the status of their delivery. There has been a growing requirement in recent times for stronger cost control and a demand for higher returns in businesses (Milis and Mercken, 2003). The use of GPS enabled fleet management systems to gain a competitive advantage has become a key strategic issue amongst organizations in the fast globalizing environment, as ICT plays a strategic role in the management of organizations. Rastrict and Corner (2010), among others, reveal that there is growing support for the positive relationship between ICT and its benefits.

The results of the current research showed a positive effect on the company's business processes in two critical areas, namely operational and in strategic planning. Chan (2000) states, "IT creates need for change in the job routines on an operational level but also leads to strategic changes such as organizational transformation". It is expected therefore that the current research will greatly benefit KPLC in deepening the effect of the GPS enabled fleet management system already implemented in its operations and also that it will provide a practical framework document for reference by companies in Kenya who wish to initiate the implementation of a GPS fleet management in their respective fleets.

However, the research evidence gained from the survey results epitomizes how the successful implementation of modern management systems in transport and logistics service providers may lead to a greatly improved logistical performance, cost-effectiveness and customer satisfaction. Transport enterprises, in particular, should embrace the modern technological advancements that enable the efficient, safe and cost-effective use of work force and improve the time management of processes in order to have a greater effect and retain relevance in service delivery.

4. CONCLUSION

The conclusions reached from the research findings demonstrate that use of telematics in real-time monitoring of vehicles is a necessary systemic, technical and technological solution for optimising fleet operation and for providing a fast response to customer needs. The

implementation of telematics gives transport the capability of using technologies and methods of remote access to vehicles or cargo through a wireless network. Being one of logistics' executive tools, telematics not only helps to support management but also to increase efficiency and competitiveness. There are considerable advantages gained from implementing real-time IT logistics solutions, including reduced accident rates, increased fleet availability, reduced operational costs and improved data management system for better management decision-making process. Stroh (2001), who maintains that initially transport logistics departments were among the last to join the personal computer trend but when the corporate powers began to realise that the distribution department could save the firm a sizable sum of money by utilising the power of the computer, these departments have become equipped with the latest technologies.

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REFERENCES

Asgarkhani, M. and A. Young, 2010. Industry view of ICT roles and skills in canterbury. Paper Presented at the First Annual Conference of Computing and Information Technology Research and Education, 6-9 July, Dunedin.

Bazeley, P., 2002. Issues in mixing qualitative and quantitative approaches to research. Paper Presented at the First International Conference on Qualitative Research in Marketing and Management, University of Economics and Business Administration, 10 April, Vienna.

Chan, S.L., 2000. Information technology in business processes. Business Process Management Journal, 6(3): 224–237.

Cordella, A., 2006. Transaction costs and information systems: Does IT add up. Journal of Information Technology, 21(3): 195–202.

De Jong, G., S. Algers, A. Papola and R. Burg, 2006. Impact of the E-economy on traffic and traffic-related indicators in urban areas. Washington, DC: Transportation Research Board, National Research Council, National Academy of Sciences.

Dima, I.C., M.N. Skowron, V. Modrak and J. Grabara, 2010. Elements of logistics, used in industrial operational management. Presov: Apeiron EU.

Ellinger, A.E., D.F. Lynch, J.K. Andzulis and R.J. Smith, 2003. B-to-b e-commerce: A content analytical assessment of motor carrier websites. Journal of Business Logistics, 24(1): 199–220.

Golicic, S.L., C.N. Boerstler and L.M. Ellram, 2010. Greening transportation in th supply chain. MIT Sloan Management Review, 51(2): 46-55.

Hay, I., 2005. Qualitative research methods in human geography. 2nd Edn., Oxford: Oxford University Press.

Hengst, M. and H.G. Sol, 2001. The impact of information and communication technology on interorganizational coordination: Guidelines from theory. Informing Science Special Series on Information Exchange in Electronic Markets, 4(3): 1–138.

Henry, G.T., 1990. Practical sampling. London: Sage, 21.

Karen, J., 2010. GPS tracking services in Kenya: Kenya Police Report. Available from http://mashamugs.wordpress.com/2010/10/07/gps-tracking-in-kenya [Accessed 15 April 2012].

Katz, D.A., 1982. Econometric theory and applications. Englewood Cliffs, NJ: Prentice-Hall.

Kent, J.L. and D.J. Flint, 1997. Perspectives on the evolution of logistics thought. Journal of Business Logistics, 18(2): 15–30.

Kish, L., 1965. Survey sampling. New York: Wiley.

Kleodon, C.N., A.J. Mclean, V.M. Moore and G. Ponte, 1997. Travelling speed and the risk of crash involvement. Report CR 172. Canberra: Federal Office of Road Safety.

Kohn, C. and M.H. Brodin, 2008. Centralised distribution systems and the environment: How increased transport work can decrease the environmental impact of logistics. International Journal of Logistics, 11(3): 229-245.

Kolbe, R.H. and M.S. Burnett, 1991. Content-analysis research: An examination of applications with directives for improving research reliability and objectivity. Journal of Consumer Research, 18(2): 243–250.

Kot, S., 2008. Collaboration in logistics outsourcing relations, W: Management 2008. International Conference. In Times of Global Change and Uncertainty. Part I. (Eds). Stefko R., Frankowsky M. Presov 2008.

Kothari, C.R., 2005. Research methodology: Methods and techniques. 2nd Edn., New Delhi: New Age International.

Krejcie, R.V. and D.W. Morgan, 1970. Determining sample size for research activities. Educational and Psychological Measurements. New York City: Sage Publications, 30: 607–610.

Krishnaveni, R. and J. Meenakumari, 2010. Usage of ICT for information administration in higher education institutions: A study. International Journal of Environmental Science and Development, 1(3): 282–286.

Marchet, G., A. Perego and S. Parotti, 2006. An explanatory study of ICT adoption in the Italian freight transportation industry. Milan: Department of Management, Economics and Industrial Engineering.

Milis, K. and R. Mercken, 2003. The use of the balanced scorecard for the evaluation of information and communication technology projects. International Journal of Project Management, 22(2): 87–97.

Nietermayer, L., 2010. GPS tracking systems on company vehicles can save fuel, labor costs, and correct bad driving habits. Available from http://www.drillingcontractor.org/gps-tracking-systems-on-company-vehicles-can-save-fuel-labor-costs-correct-bad-driving-habits-4712 [Accessed 19 May 2012].

Okuttah, M., 2009. Fleet managers turn to technology for security. Business Daily Supplement. Available from http://www.businessdailyafrica.com/blob/view/-/635460/data/92916/-/p93qscz/-/Digital-Biz.pd [Accessed 6 August 2009].

Opsi, S., 2007. OPTIMA. Demo presentation. Available from http://www.opsi.co.za/product_optima.htm [Accessed 19 May 2007].

Pasick, R.J., N.J. Burke, J.C. Barker, J. Galen, J.A. Bird and R. Otero-Sabogal, 2009. Behavioral theory in a diverse society: Like a compass on mars. Health Education Behavior, 36(5): 11S-35S.

Peterson, R.T., 1998. The portrayal of children's activities in television commercials: A content analysis. Journal of Business Ethics, 17(14): 1541–1549.

Prockl, G., H. Sternberg and J. Holmstrom, 2011. ICT in road transport operations: Analyzing potential effects on individual activity level, in Hammervoll, T. (Eds). Logistics and supply chain management in a high North perspective: The 23rd Annual NOFOMA Conference Proceedings, 9–10 June, Harstad.

Rastrict, K. and J. Corner, 2010. Understanding ICT based advantages: A techno savvy case study. Interdisciplinary Journal of Information, Knowledge, and Management. USA: Elizabeth Boyd; Informing Science Institute, 5: 305-326.

Regan, E.A. and B.N. O'Connor, 2002. End-user information systems: Implementing individual and work group technologies. 2nd Edn., Upper Saddle River, NJ: Prentice-Hall.

Sanders, N.R., 2007. An empirical study of the impact of e-business technologies on organizational collaboration and performance. Journal of Operations Management, 25(6): 1332–1347.

Shanker, D., 2008. ICT & tourism: Challenges and opportunities. Paper Presented at the Conference on Tourism in India: Challenges Ahead, 15–17. Available from IIMLhttp://dspace.iimk.ac.in/bitstream/2259/536/1/50-58.pdf. [Accessed 3 March 2011].

Smarandache, F. and Ş. Vlăduţescu, 2014. Neutrosophic emergences and incidences in communication and information. Saarbrucken: LAP Lambert Academic Publishing.

StatTrek, 2012. Random number generator. Available from www.stattrek.com/statistics/random-number-generator.aspx [Accessed 3 March 2003].

Stopher, P., C. FitzGerald and M. Xu, 2007. Assessing the accuracy of the Sydney household travel survey with GP. Transportation, 34(6): 723–741.

Stroh, M.B., 2001. A practical guide to transportation and logistics. Dumont, NJ: The Logistics Network.

Thi, D., 2011. Using data as a tool: How the smithsonian's FMIS helped streamline operations, Government Fleet. Available from http://www.government-fleet.com/channel/software/article/story/2011/11/using-data-as-a-tool-how-the-smithsonian-s-fmis-helped-streamline-operations.aspx.

Traistaru, A., 2013. The components of economic record and the research object of accounting. European Journal of Business and Social Sciences, Zurich, Switzerland, 2(6).