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The Strategic JOURNAL of Business & Change MANAGEMENT
ISSN: 2312-9492 www.strategicjournals.com
Vol. 7, Iss. 3, pp 721 – 737. August 20, 2020. www.strategicjournals.com, ©Strategic Journals

STRATEGIC INNOVATION MANAGEMENT AND ROAD SAFETY PERFORMANCE IN NATIONAL TRANSPORT AND SAFETY AUTHORITY, KENYA

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Accepted: August 17, 2020

ABSTRACT

The purpose of this study was to investigate the effect of strategic innovation management on road safety performance in National Transport and Safety Authority. The study adopted a descriptive research design. The target population was 69 National Transport and Safety Authority, Kenya. The sample size of 59 respondents was drawn by use of Slovin's statistical formula. Primary data was collected using structured questionnaire based on the objectives of the study. The data was edited, coded for processing using the Statistical Package for Social Sciences (SPSS v.25) and presented in tables. Data was edited for completeness and consistency before analysis. Descriptive and inferential statistics were used to analyze information generated from the respondents. From the findings it was established that transport integrated management systems used by the agency were effective and respondents agreed that the agency had invested in enterprise resource planning which had improved efficiency. The study results showed that respondents agreed that the systems adopted by National Transport and Safety Authority password protected and had firewalls to prevent system intrusion by the aliens. The study concluded that there was improved transparency and accountability at National Transport and Safety Authority as a result of automated payment systems. Agency system users including both customers and the agency were able to get real-time feedback which had increased efficiency and National Transport and Safety Authority had continuously undertaken to standardize service delivery so as to sustain service consistency across its offices countrywide. The study recommended that National Transport and Safety Authority should endeavor to upgrade the existing transport integrated management systems (TIMS) to make it more effective and responsive to contemporary public needs. The study recommended that the management of the National Transport and Safety Authority should adopt and encourage use of automated payment systems to reduce cases of fraud and pilferage of public funds. Further, the agency should ensure its systems provide real-time feedback to enhance service delivery efficiency.

Key Words: *Technological Innovation, Process Innovation, Service Innovation, Administrative Innovation*

CITATION Adow, A., & Kising'u, T. (2020). Strategic innovation management and road safety performance In National Transport and Safety Authority, Kenya. *The Strategic Journal of Business & Change Management*, 7(3), 721 – 737.

INTRODUCTION

Global facts and figures on the road safety scenario around the world reveal some startling statistics. More people die on the world's roads each year than the total number of people who die from malaria (World Health Organization, 2018). Globally, according to the WHO Global Status Report on Road Safety (2017), road traffic injuries claim approximately 1.25 million lives each year and have a huge impact on health and development. However, while the crash of a single jumbo jet makes headlines in the media, road fatalities, even in such large numbers, do not get the same attention. Worryingly, death by road accidents is the No.1 cause of death for young people worldwide, and the economic cost to the global economy is estimated to be a staggering $1.2 trillion a year.

Innovation is concerned with exploration of new technology and is fundamentally different from incremental innovation that is concerned with exploitation of existing technology. Radical innovation is a product, process, or service with either unprecedented performance features or familiar features that offer potential for significant improvements in performance and cost. It creates such a dramatic change in processes, products, or services that they transform existing markets or industries, or create new ones (Barney, 2016).

Internationally, a review of the crash history has identified that the run-off-road crash is one of key crash types in Queensland, Australia. Hazards on both sides of a carriageway are identified a potential risk exposed to road users. This study says that, a proper roadside design plays an indispensable role to ensure a more forgiving road environment to reduce the likelihood and severity of run-off-road crashes. To assist road engineering practitioners in roadside design, the Queensland Department of Transport and Main Roads (TMR) developed a software application - the Roadside Impact Severity Calculator (RISC), however the applicability of RISC for developing the road safety improvement program needs to be evaluated through gaining a greater understanding of the correlation between the severity index and the crash reduction factor. The existing historical crash data indicates that run -off-road and head-on type crashes account for most of the serious crashes occurring on the roads in Queensland. Hazards on both shoulder and median sides are identified as a major risk to motorists involving run-off-road crashes. Managing road side hazards in a proper manner is key to reduce the likelihood and/or severity of run-off-road crashes. The effectiveness of a road safety treatment can be expressed as either a crash reduction factor (CRF) or a crash modification factor (CMF).

In Africa, strategic innovation is significant factor for provision of firm's sustainable competitive advantage and profitability (Nybakk & Jenssen, 2015). According to Mintzberg, Ahlstrand and Lampel, (2016), organizational direction can be created by strategy innovation by providing the direction of firm's strategic efforts by focusing the strategic effort through coordination promotion and providing employees with an understanding of the firm by promoting reduction of ambiquity. In service industries like mobile telecommunication, where the industrial forces of competitive environment are strong, firms are required to constantly innovate and think strategically (Schmenner, 2015).

According to the NTSA (2017), all over the world, the consequences of road traffic accidents continue to be a drain on the scarce financial resources of nations in terms of the carnage, damage to vehicles, medical costs, and most of all, unquantifiable loss of lives. In Kenya, just like elsewhere in the world, coordinated efforts to reduce road traffic crashes have been undertaken and geared towards awareness campaigns and traffic law enforcement. Road traffic injuries have become a global health and development problem. Research done around the globe indicates that road travel puts people at the greatest risk of injury. In developing countries road crash rates remain high and Kenya is no

exception, as road crashes continue to cause untold suffering to families and rod the country of productive citizens (NTSA, 2017). Given the serious nature of road traffic injuries, various stakeholders on road safety had conducted road safety campaigns in the country.

The National Transport and Safety Authority (NTSA) is a state corporation under the Ministry of Transport and Infrastructure. NTSA was established through an Act of Parliament- Act 33 of 2012 (NTSA Act 2012) with the aim of harmonizing the operations of the key road transport departments in Kenya and to effectively manage the road transport sub-sector; minimizing loss of lives through road crashes. The vision of NTSA is sustainable and Safe Road Transport System.

The functions of NTSA is to register and license motor vehicles, conduct motor vehicle inspection and certification, regulate public service vehicles, advise the government on national policy with regard to road transport sector, develop and implement road safety strategies, facilitate the education of members of the public on road safety, conduct research and audits on road safety, compile inspection reports relating to traffic accidents, establish systems and procedures for, and oversee the training, testing and licensing of drivers, formulate and review the curriculum of driving schools, and coordinate the activities of persons and organizations dealing in matters relating to road safety. Perform such other functions as may be conferred on it by the Cabinet Secretary or by any other written Law. Consequently, road deaths in Kenya have reduced since the peak in the early 2010's. Yet over the last few years, the long-term declines have lessened and become increasingly difficult to maintain. The previous target set in the NTSA was a 40% reduction in fatalities, whereas 34% was achieved.

Statement of the Problem

In Kenya, the annual loss due to road crashes is 5% of GDP translating to KES 317 Billion (NTSA Road safety report, 2018). For instance, in 2016 there were 2965 deaths reported as a result of road accidents country wide and in 2017 there were 2919 deaths reported from road fatalities (NTSA road safety report, 2018). In the same period, National Transport and Safety Authority adopted innovative strategies such as road bumps markings, public sensitization and overhaul of driving schools' curriculum. However, despite these innovative strategies, the road fatalities reduced only by a variance of 46 between 2016 and 2017 (NTSA road safety report, 2018).

Locally, various studies have been conducted to establish the effect of strategic innovation. For instance, a study was conducted by Odhiambo (2017) focusing on Safaricom Ltd innovation strategies. Another study was carried out by Gitonga, (2016) on processes of innovation and CEO role in the telecommunication sector. Karanja (2017) conducted a study on the innovation strategies adopted by insurance companies in Kenya. However, despite many studies having been conducted in the field of strategic innovations on nearly every sector, there is no study specifically done to link strategic innovations and road safety performance. The current target of a 30% reduction in fatalities by 2020 is unlikely to be met since the reduction from 2010 to march, 2019is 5%. Further, road deaths in Kenya have not reduced in quantum over the last five years and may be increasing. This phenomenon is not unique, but is being observed in many developing countries and raises many questions, firstly, as to why it is occurring? Secondly, how can road safety management continue to improve road safety, especially in times of rapid contextual change? In addition, road safety in Kenya has not improved at the same rate as the most successful countries internationally. The reviewed empirical literature has been more focused on firm performance and none has been done on road safety performance. Therefore, this study sought to investigate the effect of strategic innovation management on road safety performance in Kenya with specific focus on National Transport and Safety Authority as the lead Agency on Road safety management in Kenya.

Research Objectives

The general objective of the study was to establish the effect of strategic innovation management on road safety performance in National Transport and Safety Authority, Kenya. The sspecific objectives were;

- To establish the effect of technological innovation management on road safety performance in National Transport and Safety Authority, Kenya
- To determine the effect of process innovation management on road safety performance in National Transport and Safety Authority, Kenya

This study was guided by the following null hypotheses;

- **$H_0$1:** Technological innovation management has no significant effect on road safety performance in National Transport and Safety Authority, Kenya
- **$H_0$2:** Process innovation management has no significant effect on road safety performance in National Transport and Safety Authority, Kenya

LITERATURE REVIEW

Schumpeter Theory of Innovation

One of the first models concerning exclusively service innovation was the model of "reverse innovation cycle" of Schumpeter in 1947 mentioned in Toivonen *et al.* (2015). In this model, the service innovation cycle has a reverse form in comparison with traditional industrial cycles. In fact, in service innovation cycle process innovation comes before product innovation. So, service companies implement new technologies with the intention of enhancing the efficiency of their processes and then the quality of service. Finally, they develop new service products (Hall *et al.*, 2015).

Schumpeter in 1934 argued that entrepreneurs, who could be independent inventors or R&D engineers in large corporations, created the opportunity for new profits with their innovations. In turn, groups of imitators attracted by super-profits would start a wave of investment that would erode the profit margin for the innovation. However, before the economy could equilibrate a new innovation or set of innovations, conceptualized by Schumpeter as Kondratiev cycles, would emerge to begin the business cycle over again.

Schumpeter emphasized the role of entrepreneurship and the seeking out of opportunities for novel value generating activities which would expand and transform the circular flow of income, but it did so with reference to a distinction between invention or discovery on the one hand and innovation, commercialization and entrepreneurship on the other. This separation of invention and innovation marked out the typical nineteenth century institutional model of innovation, in which independent inventors typically fed discoveries as potential inputs to entrepreneurial firms. The author further saw innovations as perpetual gales of creative destruction that were essential forces driving growth rates in a capitalist system. Therefore, the Schumpeter theory of innovation is a suitable theory to explain the effect of service innovation in ensuring road safety in Kenyan roads through innovations to speed up service delivery in the agency. The theory postulates how innovation in service can offer competitive advantage on the organization and service organizations design and adopt novel technologies with the view of improving the efficiency of their service processes.

Organizational Innovation Theory

Organizational innovation theory is a recent perspective with its main proponent being Sullivan. The theory argues that organization strategic innovation involves learning and knowledge accumulation of a trial and error process, rooted in experimentation that is individual and collective. Collective learning is the capacity of an organization to identify new knowledge and to capture it. The theory states that the nature of the innovation process will push firms to either adapt strategies to establish and develop such a process (innovation

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strategies) or rather adapt alternative strategies (adaptation strategies) that ensure a firm's survival without the uncertainty attached to the innovation process.

Organizational innovation, as a general phenomenon, is mainly related to the creation or adoption of new ways of managing and organizing. According to Hamel (2015), "management innovation "means" anything that substantially alters the way in which the work of management is carried out (principles and practices), or that significantly modifies customary organizational forms (structures and functions)", in order to improve organization performance. In the same vein, Birkinshaw, Hamel and Mol (2016) defines management innovation as "the invention and implementation of a management practice, process, structure or technique that is new to the state of the art and is intended to further organizational goals". Chandler (2014) states that these innovations are related to the development of "new methods and means of coordinating, evaluating and planning the effective use of a wide variety of human, financial and material resources".

This theory is suitable to explain administrative innovation and its effect on road safety performance by holistically showing how management systems and procedures can help create efficiency in the agency. The theory relates how invention and implementation of the practices of management and processes in NTSA aids in furthering the goal of improving road safety in Kenyan roads.

Disruptive Innovation Theory

Christensen (2014) defines disruptive innovation as an innovation which when introduced in the market creates a new network eventually displacing products and firms that have been established over a period of time. This means that disruptive product innovations emanate from outsiders rather than already market leading firms in place. However, disruptive product innovation may take longer to develop other forms of innovations, but once the product is introduced in the market, it penetrates faster and hence a higher degree of impact in established markets.

Sustaining innovations are normally pursed at the higher tiers of their markets where most customers will equate the price of a commodity to its quality. Organizations achieve greatest profitability by charging the highest prices to their high-class customers (Christensen, 2014). In their initial stages disruptive businesses are characterized by lower profits and smaller markets. Therefore, disruptive innovation theory helps link both technological innovation and process innovation and explain how they both affect road safety performance.

Diffusion of Innovation Theory

Diffusion of Innovation (DOI) Theory, developed by Rogers in 1962 explains how, over time, an idea or product gains momentum and diffuses through a specific population or social system. Through the diffusion people adopt the product, behavior, or new idea. The theory presumes that a new idea, practice or object has a perceived channel, time and mode of being adopted by individuals or organizations. For adoption to take place, the person must perceive the idea, behavior, or product as new or innovative. In this theory therefore adoption means the decision to fully use an innovation as the best alternative and thus the person does things differently from the way they did previously.

According to Lieberman and Montgomery (2016) inventions are by definition, only introduced by one firm, or at most by a small handful of firms that bring a new product or service to market simultaneously. Companies that succeed in commercializing an invention are sometimes known as first movers. If an invention involves proprietary technology then the first firm to obtain the patent or copyright wins the exclusive right to market the product. Both supply and demand side factors influence the decision to adopt. From the demand perspective, there is some consumer demand for this facility. On the supply side, protection of reputation, competition, cost savings, mass customization, enhancement of marketing and

communication activities, and retention and attraction of consumers (Daniel & Storay, 2016).

The theory of diffusion of innovation is important in understanding innovation as it explains how new ideas or innovations are adopted. Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system (Rogers, 2015). The rates of adoption for innovations are determined by an individual's adopter category. According to Lieberman and Montgomery (2014), inventions are by definition, only introduced by one firm, or at most by a small handful of firms that bring a new product or service to market simultaneously. Companies that succeed in commercializing an invention are sometimes known as first movers. If an invention involves proprietary technology then the first firm to obtain the patent or copyright wins the exclusive right to market the product.

Chandler (2014) states that preemption of scarce assets can sometimes provide an advantage to one or a few first movers that will not be available to those that adopt the innovation later. According to Rogers, the creation of buyer switching costs can also provide an advantage to one or a few first movers that are denied to followers. Firms seeking to gain one or another of these advantages are sometimes referred to as first movers. Those that do not aim for invention, but innovate by adopting an invention that appears to be a winner, can be said to be late movers (Tushman & Anderson, 2014). The diffusion of innovation theory is suitable to explain how technological innovation is embraced by the stakeholders since its success or failure affects road safety performance.

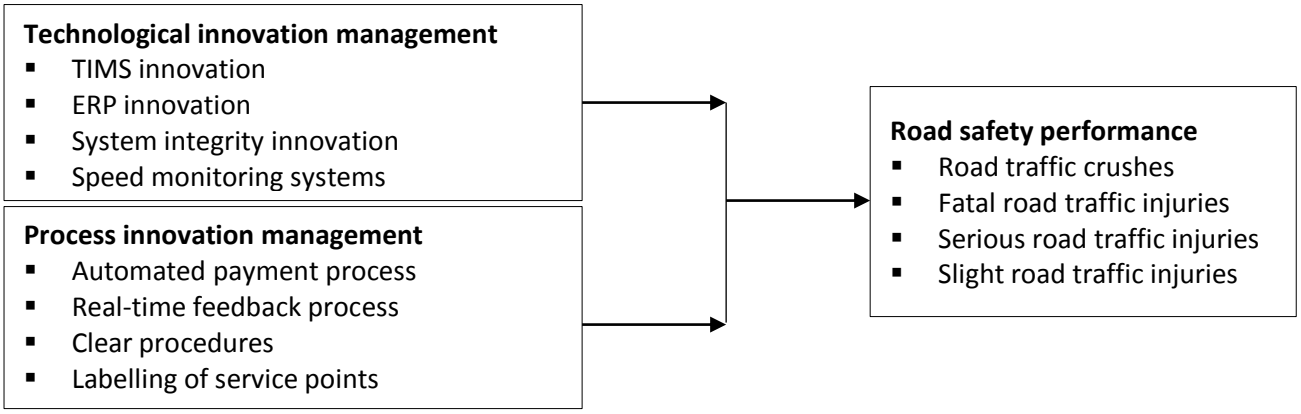

Figure 1: Conceptual framework

Empirical Review

Aswani, (2017) did a study to investigate the effect of strategic innovation on performance of public universities. The study established that there exists a strong relationship between strategic innovation indicators and the public universities' performance. Lusweti *et al.* (2016) did a study to investigate the innovation strategies used by radio stations in Kenya. The study results showed that innovation strategies are very important and should be embraced by firms at all costs since it was found that they positively affect performance. Senguo and Kilango (2015) investigated the relationship between administrative innovation and improving customer satisfaction at Vodacom. The study revealed that administrative innovation was adopted by telecommunication organisations to improve business performance and achieve competitive advantage.

Youtie and Roper (2016) undertook a study on impact of product and process innovation on profitability of manufacturing firms in Georgia, United States of Africa using a survey research

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design. The study used questionnaires to collect the primary data used. The total population studied consisted 653 firms out of which a sample of 110 firms was selected. The conclusion of the study was that product innovation matters most for the most profitable manufacturing establishments while process innovation is more widespread among firms with more modest levels of profitability.

Mugo (2015) undertook a study with an objective to investigate the relationship between innovations and performance of Kenya's wine industry using a descriptive research design. The study collected primary data using questionnaires. The population of the census study consisted of five main wine companies in Kenya. Descriptive statistics and a suitable regression model was used to do the data analysis. The research study found that innovations are indispensable to companies' future growth and sustainability. Wine companies with serious innovations, improved their profitability. The study concludes that innovations helps an organization in obtaining a clear direction as regards innovation and therefore the efforts of the entire organization are directed to a common innovation goal and this positively impacts on their performance.

A study by Nauwankas (2017) sought to investigate the factors affecting innovation strategies development and implementation. The study results established that the main challenges in the development and implementation of innovation strategies include resistance from the key stakeholders which include staff, customers, and suppliers among others, the high cost associated with formulation and implementation as well as the rapid changes in technology leading to continuous innovations. A study conducted on behalf of the NRSC of Namibia, seeking to assess the effectiveness of road safety campaigns in different media, reported that the campaigns were received by road users at different rates depending on the availability of the media in a particular area. As regards behaviour change levels, the study also noted positive behaviour for those who were aware of the campaigns.

Simiyu (2016) carried out a study on type of innovation strategies employed by commercial banks in Kenya. The study revealed that resources and capabilities were the main new market innovations adopted by commercial banks. The study also established that commercial banks adopted product innovation strategies which helped the banks to earn more profit, there was faster business growth, to invest more and also in improving the firm's productivity.

Odhiambo (2016) evaluated innovation strategies adopted by Standard Chartered Bank. The study established that the bank had employed innovation strategies to assist the bank stay afloat the stiff competition posed by financial globalization and to enhance their methods for working together keeping in mind the end goal to draw in and keep up existing clients. The study revealed financial globalization has forced financial institutions to innovate so as to survive competition posed by globalization.

METHODOLOGY

The descriptive survey design was adopted in carrying out this study. The target population under the study were staff of National Transport and Safety Authority, Kenya. According to NTSA (2019) there were 69 senior and middle level managers country-wide. The current study focused on senior and middle level management drawn from licensing, motor vehicle inspection, ICT, road safety, corporate communication and research & development. The sampling frame for this study consisted of the National Transport and Safety Authority senior and middle level managers in Mombasa region. The sample was calculated using the Slovin's statistical formula. Stratified random sampling was used to select 59 respondents. Primary data was collected using structured questionnaire. Secondary data was obtained from NTSA safety reports, published journals and past studies. A pilot study was administered in order to test for validity, reliability and practicability of the research instruments. The data collected was coded and analyzed using the Statistical Package for Social

Sciences (SPSS version 25) tool. Both descriptive and inferential analyses were generated. The regression analysis was guided by the following model:

$Y = \beta_\Theta + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$

Where:

Y= Road safety performance

β_Θ = constant term indication the level of performance in absence of any independent variables

Then:

β1, β2 are the coefficient function of the independent variables,

X_1= Technological innovation management

X_2= Process innovation management

ε is the error term which is assumed to be normally distributed with mean zero and constant variance

RESULTS AND DISCUSSIONS

Descriptive Results

This study carried out the following descriptive statistics; mean, standard deviation of all the study variables.

Technological Innovation Management

The first objective of the study sought to investigate the effect of technological innovation management on road safety performance. A likert-scale data was collected rating the extent of agreement in a scale of 1 to 5 where 1 was the strongly disagree whereas 5 was the strongly agree indicator. The findings indicated that respondents agreed that the transport integrated management systems used by the agency were effective as indicated by a mean of 4.34 and standard deviation of 0.642. The respondents further agreed that the agency had invested in enterprise resource planning which has improved efficiency as shown by a mean of 4.04 with a standard deviation of .581. Findings also showed that majority of respondents (mean = 4.15; std. dev. = .333) the systems adopted by the agency were protected by firewalls and passwords. Finally respondents agreed that the agency had invested in high end speed detector gadgets as indicated by a mean of 4.39 and a standard deviation of .291. The findings agreed with Valacich and Schneider (2015) that technological innovation strategies adopted should help to identify and explore new revenue opportunities and improve customer satisfaction through reliable delivery. The systems should also help improve firm activities by automating routine tasks such as order management. The results were shown in Table 1.

Table 1: Technological innovation management

Technological innovation management	N	Mean	Std. Deviation
The transport integrated management systems used by the agency are effective	54	4.34	.642
The agency has invested in enterprise resource planning which has improved efficiency	54	4.04	.581
The systems adopted by the agency are protected by firewalls and passwords	54	4.15	.333
The agency has invested in high end speed detector gadgets	54	4.20	.435
Technological innovation management	**54**	**4.18**	**.498**

Process Innovation Management

The second objective of the study sought to establish the effect of process innovation management on road safety performance. Data was collected through the Likert-scale measuring the level of agreement of the respondents with respect to the given aspects of process innovation management. From the findings, respondents agreed that the automated payment systems have enhanced accountability as indicated by a mean of

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4.13 and standard deviation of 0.844. The respondents agreed that the customers and the agency are able to get real-time feedback as shown by a mean of 4.39 and a standard deviation of 0.275. Further, the respondents agreed that there is laid down procedures which has brought uniformity in service delivery (mean=4.35). Finally the respondents agreed that service delivery processes are well marked to aid public in accessing the services as indicated by a mean of 4.04 with a standard deviation of 0.369. The findings were corroborated by Simiyu (2016) who concluded that process innovation strategies have assisted commercial banks to earn more profit. The results were as presented in Table 2.

Table 2: Process innovation management

Process innovation management	N	Mean	Std. Deviation
The automated payment systems have enhanced accountability	54	4.13	.844
The customers and the agency are able to get real-time feedback	4	4.39	.275
There is laid down procedures which has brought uniformity in service delivery	54	4.35	.339
My firm does not offer debt management literacy pro Service delivery processes are well marked to aid public in accessing the services gram	54	4.04	.369
Process innovation management	**54**	**4.23**	**.457**

Road Safety Performance

According to the findings in Table 3, respondents agreed that the number of road traffic crashes have reduced in the last five years as indicated by a mean of 4.46 and standard deviation of 0.219. The respondents further agreed that the number of fatal road traffic injuries has reduced in the last five years as indicated by a mean of 4.22. Respondents agreed that the number of serious road traffic injuries has reduced in the last five years and there is reduction in the number of slight road traffic injuries as indicated by a mean of 4.13 and a mean of 4.29 respectively. The study results on road safety performance are as presented in Table 3.

Table 3: Road safety performance

Road safety performance	N	Mean	Std. Deviation
The number of road traffic crashes have reduced in the last five years	54	4.46	.219
The number of fatal road traffic injuries has reduced in the last five years	54	4.22	.442
The number of serious road traffic injuries has reduced in the last five years	54	4.13	.385
The number of slight road traffic injuries has reduced	54	4.29	.751
Road safety performance	**54**	**4.28**	**.349**

Correlation Analysis

Correlation results showed that there was a moderate positive correlation between technological innovation management and road safety performance (r=0.495, P=0.000). Further, correlation results showed that the correlation between process innovation management and road safety performance was significant and positive (r=0.401, P=0.000). The correlation results also showed that correlation between service innovation management and road safety performance was moderately positive and

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significant as indicated by r=0.417, P=0.000. Finally, there was a moderate significant relationship between administrative innovation management and road safety performance (r=0.324, P=0.018). The results are shown in Table 4.

Table 4: Correlation coefficient

		Technological innovation	Process innovation	Service innovation	Admin innovation	Performance
Technological innovation	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	54				
Process innovation	Pearson Correlation	.679**	1			
	Sig. (2-tailed)	.000				
	N	54	54			
Performance	Pearson Correlation	.466**	.401**	.417**	.324	1
	Sig. (2-tailed)	.000	.000	.000	.018	

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

Regression Analysis

Test of significance was carried out for all variables studied using t-test at 95% level of significance. From the observation any p-value that is less than 0.05 was deemed to have significant relationship with the dependent variable, else the relationship was considered insignificant. The adjusted R square was used to measure the degree of variability of the dependent variable due to the changes in the independent variables.

Model Summary

According to regression results, the regression equation between strategic innovation management and road safety performance had a moderate regression. In the model summary, the R^2 is 0.529 indicating that independent variables (Technological innovation management, Process innovation management) explain 52.9 percent variation in road safety performance, while the remaining 47.1% were attributable to other factors not considered in the study. The results for the model summary were as presented in Table 5.

Table 5: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.727[a]	.529	.518	1.768

a. Predictors: (Constant), Technological innovation management, Process innovation management

Analysis of Variance

Analysis of variance was employed to test the overall significance of the regression model. ANOVA results showed that the significance value in testing the reliability of the model for the relationship between strategic innovation management and road safety performance was obtained as 0.00 which is less than 0.05, the critical value at 95% significance level. Therefore the model is statistically significant in predicting the relationship between strategic innovation management and road safety performance. The F value calculated is 13.765 indicating a significant model for the relationship as given by the regression coefficients. This showed that the overall model was statistically significant and reliable in explaining the effect of the predictor variables on road safety performance. The results were presented in Table 6.

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Table 6: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	582.755	2	291.377	28.653	.000[b]
	Residual	518.625	51	10.169		
	Total	1101.380	53			

a. Dependent Variable: Road safety performance

b. Predictors: (Constant), Technological innovation management, Process innovation management

Multiple Regression Coefficients

$Y= 3.512 + 0.337X_1 + 0.299X_2$

The regression equation above had established that taking all factors into account (road safety performance as a result of technological innovation management, process innovation management) constant at zero, road safety performance would be 3.512. Regression results further indicated that technological innovation on road safety performance had a positive and significant relationship (beta=0.337, p-value 0.000). The findings implied that an increase in the technological innovation management by one unit would lead to increase in road safety performance by 0.337 units. Results further indicated that process innovation management had a positive and significant relationship with road safety performance (beta=0.299, p-value 0.019). The findings implied that an increase in the process innovation management by one unit would lead to increase in road safety performance by 0.299 units. From the table it was noted that the predictor variables of all independent variables got variable coefficients statistically significant since their p-values were less than the common alpha level of 0.05. The multiple regression coefficients results were provided in the Table 7.

Table 7: Regression Coefficients

		Unstandardized Coefficients		Standardized Coefficients	
Model		B	Std. Error	Beta	t
1	(Constant)	3.512	1.035		3.393
	Technological innovation	.337	.122	.655	2.762
	Process innovation	.299	.145	.344	2.062

a. Dependent Variable: Road safety performance

Hypotheses Testing

Given the P values, hypotheses testing can be concluded as below.

$H_0$1: Technological innovation management has no significant effect on road safety performance in National Transport and Safety Authority.

In relation to the variable technological innovation management, the results showed that it had positive and significant effect on road safety performance. This was supported by regression analysis t-value of 2.762 which is greater than the critical value 2.0 and a p-value of 0.00 at 95% level of significance which was less than 0.05. After testing the hypothesis by comparing the scores of calculated t-value and critical t calculated t-values as 2.762 for technological innovation management, which is greater than the critical t54-1 (0.05)= 2.0, the study rejected the null hypothesis that there is no significant effect of technological innovation management on road safety performance of National Transport and Safety Authority.

$H_0$2: Process innovation management has no significant effect on road safety performance in National Transport and Safety Authority.

In relation to the variable process innovation, the results indicated that process innovation has a positive and significant effect on road safety performance. This was supported by regression analysis t-value of 2.062 which was greater than the critical value 2.0 and a p-value of 0.019 at 95% level of significance which is less than 0.05. After testing the hypothesis by comparing the scores of calculated t-value and critical t; Calculated t-values was, 2.062, which is greater than the critical t54-1 (0.05) = 2.0. The study rejected the null hypothesis that there is no significant effect of process innovation management on road safety performance of National Transport and Safety Authority.

Table 8: Hypotheses test results

Hypotheses	Standardized beta	t-test	P-value	Decision
Technological innovation management has no significant effect on road safety performance in NTSA	0.337	2.762	0.00	Reject $H_0$1
Process innovation management has no significant effect on road safety performance in NTSA	0.299	2.062	0.019	Reject $H_0$2

Discussion

The first objective of the study sought to investigate the effect of technological innovation management on road safety performance in National Transport and Safety Authority. Regression results indicated that the coefficient for technological innovation management is 0.337 and a corresponding p-value < 0.05 which indicates that the relationship is significant. It was concluded that holding all things constant, an increase in the technological innovation management by one unit would lead to increase in road safety performance by 0.337 units. The results agree with Valacich and Schneider, (2015) that technological innovation strategies adopted should help to identify and explore new revenue opportunities and improve customer satisfaction through reliable delivery. The systems should also help improve firm activities by automating routine tasks such as order management.

The second objective of the study sought to establish the effect of process innovation management on road safety performance in National Transport and Safety Authority. Regression results indicated that the coefficient for process innovation management is 0.299 and a corresponding p-value < 0.05 which indicates that the relationship is significant. It was concluded that holding all things constant, an increase in the process innovation management by one unit would lead to increase in road safety performance by 0.299 units. The results agree with a study by Simiyu (2016) who concluded that process innovation strategies have assisted commercial banks to earn more profit.

CONCLUSSIONS AND RECOMMENDATIONS

Based on the research findings, the study concluded that National Transport and Safety Authority transport integrated management systems (TIMS) are effective and responsive. The agency had continuously enhanced efficiency through adoption and implementation of Enterprise Resource Planning and the information systems used by National Transport and Safety Authority are password protected and have firewalls to prevent system intrusion by the unauthorized personnel. The study concluded that National Transport and Safety Authority speed monitoring in the roads had been improved through adoption of high end speed detector gadgets.

The Strategic Journal of Business & Change Management. ISSN 2312-9492 (Online) 2414-8970 (Print). www.strategicjournals.com

The study concluded that there was improved transparency and accountability at National Transport and Safety Authority as a result of automated payment systems. Agency system users including both customers and the agency were able to get real-time feedback which has increased efficiency and National Transport and Safety Authority has continuously undertaken to standardize service delivery so as to sustain service consistency across its offices countrywide. The agency has directional markings to help the public access services with ease.

The study recommended that National Transport and Safety Authority should endeavor to upgrade the existing transport integrated management systems (TIMS) to make it more effective and responsive to contemporary public needs. The agency should continuously seek to enhance efficiency by adopting current Enterprise Resource Planning systems.

National Transport and Safety Agency should develop and implement an institution wide information system which is dynamic and responsive. This is because the agency serves the entire republic and its systems should be reliable and provide real time response. The agency should enhance its existing information systems like Transport Integrated Management Systems to make them more responsive and compatible with all application softwares.

The study also recommended that the management of National Transport and Safety Authority should ensure round the clock protection of information systems by use of strong passwords and firewalls to lock the systems from unauthorized intrusion thus minimize cyber fraud. The leadership of NTSA should collaboratively work with other government agencies to ensure smooth implementation of road traffic rules and traffic lights should be installed in all major towns in the country to reduce road fatalities. It is also recommended that the agency should empower its IT department by providing necessary resources and innovative environment.

The study recommended that the management of the National Transport and Safety Authority should adopt and encourage use of automated payment systems to reduce cases of fraud and pilferage of public funds. The agency should ensure its systems provide real-time feedback to enhance service delivery efficiency and the service should be standardized so as to sustain service consistency across its offices countrywide. This can be achieved through use of directional markings and customer care units across all the offices to assist the public get necessary information on how to access services. The study recommends that the management of National Transport and Safety Authority should adopt and implement time and queu management systems to enhance service turnaround time. This would enable the agency serve its customers efficiently. Futher, the management should enhance service physical appearance which would instil confidence and trust in the eyes of the customers of the agency.

Areas of Further Study

This study narrowed on investigating strategic innovation management and road safety performance in National Transport and Safety Authority. However, since only 52.9% of results was explained by the independent variables in this study, the researcher recommended that a study be carried out on other strategic innovation management factors to determine how they would affect road safety performance across the country.

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