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Transport Management Practices and Safety Performance of Public Transport Organizations in Nairobi

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Abstract: *Road accidents cost the country, as is the case in other developing jurisdictions across the world, a loss of over 4% of the GDP. In Kenya, road accidents have been on the rise unlike in some developed nations. A substantial percentage of the road accidents involve public service vehicles. The transport management practices that could influence road safety performance of public sector organizations is yet to be empirically examined. This study sought to examine the effect of e-transport, fleet maintenance, fleet monitoring, and fleet technical capacity in Kenya. The study collect data from the 64 public transport organizations in County of Nairobi. Data was analyzed by applying descriptive and inferential statistics; which was be used to test the hypothesis of the study. This study established that transport management practices have a significant and substantial effect on the safety performance of public transport organizations. The study however established that public transport organizations in the county of Nairobi have a significantly low level adoption of e-transport, fleet maintenance mechanisms, and very low crew qualification requirements. The study recommends that adoption to a higher level, of these practices, could significantly reduce the number of accidents involving public sector transport organizations in Kenya.*

Keywords: transport management, e-transport, fleet technical capacity fleet maintenance, transport safety performance

INTRODUCTION

Transport services enable the supply chain of all items known to humanity; and is seen by the World Bank (2024) as a key enabler of essential services such as economic activity, Education and

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Health care. Transportation has been linked severally to output levels, income and employment in all nations of the world. In developed economies for instance; it accounts for up-to 12% of the GDP; and further accounts for up-to 25% of the cost of the GDPs in developed economies (Jean & Theo 2024). According to Hickman et al (2015) efficient transport system catalyze economic and social advancement in the society that ultimately results in improved market access, investment, improved quality of life, and reduced cost of business. Public transport is a fundamental component of transportation services worldwide. According to the International Association of Public Transport (UITP, 2024), public transport in Europe significantly impacts economic performance, contributing more than 150 billion pounds annually to the economies of European countries. This contribution represents over 1.2% of the continent's Gross Domestic Product (GDP).

Moreover, public transport stands as one of the largest employment sectors globally. In Europe alone, it directly employs over two million individuals, providing jobs that are vital for many communities. In the United States, Statista (2024) projects that public transport will generate approximately 76 billion U.S. dollars in revenue in 2024. Additionally, it is expected to transport more than half a billion individuals by the year 2028. This trend emphasizes the growing reliance on public transport services as urban populations increase. In Africa, similar trends are visible; Statista (2024) estimates that public transport will generate around 8.39 billion U.S. dollars by the end of 2024 and facilitate the movement of about 680 million passengers by 2028. This growth is particularly crucial as urbanization accelerates, especially in African developing nations, necessitating a focus on enhancing the efficiency of public transport systems (WB, 2024).

However, the effectiveness of public transport systems faces numerous challenges. A major issue affecting these systems globally is inadequate infrastructure, a problem that is especially severe in developing countries (Boakye, 2022). This lack of proper infrastructure often leads to significant traffic congestion, increased transportation costs, and higher emissions of harmful pollutants. These factors have become pressing concerns for governments and policymakers who are striving to create sustainable and effective transport solutions (WB, 2024). Safety within public transport systems is a critical issue, particularly in developing economies where rapid urbanization is on the rise (Lars, 2023). While advanced nations such as those in Europe have seen a reduction in public transport-related accidents and fatalities, developing nations are experiencing the opposite trend. The Public-Private Infrastructure Advisory Facility (PPIAF) reported that as much as 85% of public transport fatalities occur in developing countries. Data from Kaptou (2015) highlights that the rate of public transport accidents has increased by over 300% in African developing countries.

This downward trend in safety performance can be illustrated through recent reports from Kenya. Kinyanjui (2024) analysis indicated that the number of Kenyans involved in traffic accidents surged by 1,908 from January 2024 to April 2024, in comparison to the same period in 2023. Such accidents impose a significant economic burden and result in the loss of productive lives, with

estimates suggesting that developing nations could lose over 4% of their GDP due to these incidents. The repercussions of road accidents involving public transport vehicles are profound, leading to substantial loss of life, disability, and increased dependency among the affected populations, alongside various negative socio-economic and psychological consequences. The underlying causes of these accidents often relate to failures in the areas of enforcement, evaluation, education, and engineering. Poor driving habits, speeding, driving under the influence of alcohol, overloading, slippery road conditions, inadequate road markings, fatigue among drivers, and a lack of proper driver training have been identified by the National Transport and Safety Authority (NTSA, 2024) in Kenya as primary contributors to road accidents involving public transport vehicles. Addressing these issues is crucial for improving safety and ensuring efficient public transport services (Omondi, 2024).

Statement of the Problem

Transport services enable the supply chain of all items known to humanity; and is seen by the World Bank (2024) as a key enabler of essential services such as economic activity, Education and Health care. Transportation has been linked severally to output levels, income and employment in all nations of the world. Literature shows that there exists a mix of practices and tools such as public transport management system, policies, artificial intelligence, IOT, good infrastructure and carefully crafted culture to manage public safety in developed nations (CISCO, 2017; Tadviser, 2019, & Bolobonov et al, 2021). In these countries, the rate of accidents in the public sector appear to be reversing in the last couple of years (Lars, 2023).

In Kenya however, as is generally the case in developing Nations of Africa, the number of deaths from road accidents increased 2.4% in 2022 when compared to the 2021 statistics. In Kenya, Kinyanjui reports that Kenyan's involved in accidents have risen by 1908 in the period January 2024 to April 2024 when compared to the same period of the year 2023. A substantial portion of these deaths seem to occur from the public sector transport (NTSA 2024). KNA (2023) reports that the accidents cost the county up-to 5% of the GDP; and cause devastation in the society as they mostly involve people of productive age. This is even as the government has rolled out effort to mitigate the causes of the accidents through public campaigns, installation of speed limiters in public service vehicles, and crackdown of non-roadworthy vehicles.

Extant literature examines some of the issues related to public transport safety performance. For instance, Wangari (2016) examines Gender based issues arising in public transport vehicles; while Njoroge (2019) examines quality management in transport Saccos in Nairobi. Extant literature seems not to outline the important logistics management practices that public transport organizations could adopt to improve safety performance. Therefore this study seeks to examine public transport organizations safety performance from the perspective of transport management practices.

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Objectives of the study

The study was guided by the following specific objectives:

i. To examine the effect of e-transport Management on the safety performance of public transport organizations in Nairobi
ii. To assess the effect of fleet maintenance on the safety performance of public transport organizations in Nairobi
iii. To examine the effect of Fleet monitoring on the safety performance of public transport organizations in Nairobi
iv. To assess the effect of Fleet technical capacity management on the transport resource the safety performance of public transport organizations in Nairobi

Theoretical Review

Diffusion of Innovation on E-Transport Management

The Diffusion of Innovations Theory was developed and popularized by Rodgers (1962) in his book "Diffusion of Innovations". It originates in the communication field and seeks to explain how ideas, new products or innovations permeate the populations. This permeation is what is referred to as diffusion (Rodgers, 2003). The theory observes that people adopt ideas or innovations at different paces through five stages of Learning about the innovation; forming an opinion about the innovation; deciding whether to use the innovation; analysis of its contribution; and confirmation on whether to use the innovation. The theory further distinguishes between early adopters and later adopters of innovation and further identifies the elements of adoption of innovation to include: Innovation; adopters; communication channels time; and social systems (McCullen, 2013). Rodgers' work in 1962 and 2003 presents a comprehensive analysis of the five key characteristics of innovations that potential adopters carefully evaluate before incorporating them into their processes.

This theory enables the study to draw insightful comparisons between the early adopters of these technologies in developed nations (as exemplified by Bolobonov et al, 2021) and the subsequent adoption in Kenya's public sector, representing a later adopter/laggard case in the context of developing nations (Zanule, 2015). This comprehensive review not only provides a basis for comparative analysis but also paves the way for the development of a robust conceptual framework. This framework is specifically designed to explore and propose strategies to expedite the adoption of these innovative digital solutions among public transport organizations. The proposed strategies encompass a wide array of approaches, including policy persuasion and educational initiatives aimed at highlighting the comparative advantages of these technological solutions. In summary, this study is poised to contribute significantly to the understanding of the dynamics and determinants of technology adoption within the public transport sector, offering valuable insights that can inform policy and practice in this rapidly evolving domain.

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Maintenance Theory and Fleet Management

The maintenance Theory, fronted by (Schuyler, 2023) sits at the intersection of sustainability, social value and science, and preservation. It espouses the reality of deterioration subject to time and condition; even operant conditions. The theory by Schuyler (2023) depicts cycles of repair to preserve or slow deterioration. This theory brings to fore the need for cycles of repair as a factor of preservation. When considering the principles from the theory of maintenance in relation to fleet management, it becomes clear that these concepts apply effectively. Vehicles, influenced by their operational conditions, age, and design, naturally face deterioration over time, as observed by Kleefed and Chen in their 2015 study. This understanding is crucial in the context of vehicle maintenance, suggesting that to maintain or at least slow down the deterioration of vehicles, regular maintenance practices are essential. Consequently, these maintenance activities play a significant role in ensuring the quality and safety of the vehicles within a fleet.

This theoretical framework provides a valuable perspective for examining how fleet management practices, particularly those related to vehicle maintenance by public transport organizations, impact safety performance. The study will focus specifically on various types of maintenance strategies, including preventive planned maintenance and corrective maintenance. Additionally, it will address maintenance audits and strategic decisions related to vehicle replacement, as highlighted by Supriatana et al (2016). The investigation will analyze not only the types of maintenance practices employed by public transport organizations but also their frequency and the resulting effects on safety performance. By exploring these elements in detail, the study aims to create a conceptual foundation that will facilitate empirical evaluation of the relationship between effective maintenance practices and enhanced safety outcomes in public transportation.

Theory of Change and Fleet Monitoring

According to Moore (1995), the 'Theory of Change' serves as an evaluation method that emphasizes engaging with various stakeholders involved in a program. As highlighted by McLellan (2021), the Theory of Change framework helps to identify long-term goals and the necessary conditions required to achieve these aspirations. This framework serves as a foundation for establishing an outcome-oriented perspective. It underscores the importance of monitoring and evaluating strategic processes within organizations. These evaluations are essential for facilitating corrective actions and adaptive management in relation to the attainment of organizational objectives. Furthermore, McLellan (2021) notes that this evaluation model allows for the identification of gaps between anticipated processes and expected outcomes. Through this lens, the Theory of Change can clarify the role of monitoring within fleet management, particularly concerning the safety performance of public transport organizations. It highlights the necessity of recognizing gaps in processes that may hinder the achievement of safety objectives, such as non-compliance with established safety systems and regulations. These compliance failures have been

identified as significant contributors to accidents within the public transport sector. As a result, the application of the Theory of Change enables this study to define a conceptual framework for monitoring that aligns with the safety performance goals of public transport organizations. By establishing this framework, the study aims to address the critical issues surrounding safety compliance and ultimately improve outcomes related to public transportation safety.

Resource Based View and Fleet Technical Capacity Management

The resource based view brings to fore the importance of an organizations resources to its capabilities. According to Barney (1991), the resources of an organization: Physical; Human; Financial; or otherwise; provide the organization with its ability to achieve competitive advantage. The managers of an organization decides the characteristics of the resources to exploit while considering the competitive external environment and opportunities (Jurevicius, 2013). Further, to enhance their capabilities, these resources must be natured or improved. This nurturing of the organizations resources, has a remarkable effect on improving the organizations innate capabilities in the competitive environment (Gerhart & Feng 2021). Following this line of thought, its easy to conclude then that; poorly nurtured or managed resources limit the organization's capability to compete or operate efficiently relative to its mandate.

Therefore this theory gives this study a theoretical framework for framing the empirical analysis of the fleet capacity management and its effect on safety performance of public transport organizations. According to Lindwe (2022), most accidents are directly traceable to the organizations' technical resources factors: such as drunk driving; fatigue; lack of proper skill; lane discipline; and lack of safety training. Therefore this theory brings to prominence the factors that this study needs to assess; that are related to fleet technical capacity; and strategies that could be used by organizations in the public transport to nurture the technical capacity that would improve the public transport organizations capabilities in delivering their mandate in a safe manner.

Empirical Review

Numerous studies have explored and analyzed the variables relevant to this research. In the area of electronic transport management, scholars such as Adebayo and Aworemi (2017), Singh (2023), Heinbach et al. (2022), Akkerman et al. (2019), and Dmitriev (2019) have investigated the application of digital tools in managing transportation systems. Their work provides empirical evidence demonstrating the beneficial impacts of these tools on aspects such as transport visibility, operational optimization, and analytics. Furthermore, they establish a connection between the use of digital tools and improvements in safety measures. However, while these studies offer valuable insights into certain dimensions of this research, none have specifically focused on the empirical effects of electronic tools on the safety performance of public transport systems. Additionally, the majority of these investigations are based on contexts outside of Kenya, thereby neglecting the unique dynamics present in the Kenyan transport environment. In terms of fleet maintenance, there

are limited studies that specifically assess the relationship between fleet maintenance practices and safety in transportation. Researchers like Aflabo et al. (2020), Kelleen (2019), Lee et al. (2017), and Rawat and Lad (2017) present intriguing viewpoints on preventative maintenance strategies, particularly those that incorporate intelligence and time-dependent frameworks. These frameworks highlight their influence on the overall performance of transportation systems; however, they do not address the critical intersection of fleet maintenance and safety performance directly.

Similarly, research related to fleet monitoring has predominantly been conducted in international settings that are more advanced than the situation in Kenya. Studies by Aflabo et al. (2020), Tembe (2023), Mazinga (2020), Ali (2018), and Carter (2012) offer essential insights into various models, tools, and strategies for effective fleet monitoring. These findings could contribute to shaping the conceptual framework of this study. Nevertheless, they fall short of providing empirical evidence that connects fleet monitoring practices to safety performance specifically within the Kenyan context. Furthermore, there is a scarcity of research focusing on fleet technical capacity. Studies by Sangrar (2019), Niekerk et al. (2019), and Cassut (2014) provide valuable perspectives on how enhancing fleet technical capacity through driver training can influence safety outcomes. However, these studies similarly do not adequately address the concept of fleet safety performance within the Kenyan public transport sector. This gap indicates a need for further research that focuses on the local context and investigates the connections between these crucial elements in the transportation industry.

RESEARCH METHODOLOGY

This study aimed to analyze how these management practices impact the safety performance of these organizations. To effectively conduct this examination, the study adopted a descriptive research design. This approach is defined by Osuagwu (2022) as one that aims to provide a clear and detailed description of the subjects being researched, capturing their characteristics in their existing state. The study collected data from a total of 64 large public transport organizations that operate within Nairobi County. In this research framework, the organizations themselves will serve as the unit of analysis, providing a comprehensive overview of their operational practices and management strategies. The transport managers from these organizations were identified as the units of observation.

Questionnaires were administered using either the drop and pick method or through direct interviews. The drop and pick method involves leaving the questionnaire with respondents and collecting it later, while the interview method allows for real-time interaction and response collection. According to Frolich and Schellhammer (2022), the use of questionnaires is particularly beneficial for researchers as it enables the collection of sufficient data from respondents in a consistent and standardized manner. This approach will help ensure that the findings of the study

are reliable and can provide valuable insights into the transport management practices that impact safety in public transport organizations.

The study focused on the evaluation of the data collection instrument to determine both its completeness and appropriateness for the research objectives. This will be accomplished by conducting a pilot study involving a selection of minor public transport organizations located within Nairobi. A total of ten organizations will be included in this pilot study, all situated in Nairobi County. According to Dzwigol (2020), conducting a pilot study is a critical step that helps to ensure the accuracy and reliability of the results obtained from the research instrument being tested. The Chronbach's Alpha was be used to examine the reliability of the research instrument. According to Hunziker and Blankenagel (2021) Chronbach's alpha (α) (Cronbach, 1951) is a common reliable measure of validity of items in a questionnaire. The study will set cut offs at 0.7 as recommended by Cronbach (1951) Items not attaining this cut-off were examined and corrected.

RESULTS AND DISCUSSION

Response Rate.

The study sought to collect data from 64 transport organization in County of Nairobi. Therefore, 64 questionnaires were issued to transport managers of the public transport organizations in the county of Nairobi. However, only 42 questionnaires were collected having been fully filled. Therefore the response rate of this study was 66% as shown on table 1.

Table 1: Response Rate

	Questionnaires issued	Questionnaires returned	Non-responsive
Frequency	64	42	22
Percentage	100	66	34

This response rate is deemed sufficient to allow for data analysis. As per recommendations of Aityan (2022), a response rate above 60% is deemed sufficient for data analysis. Therefore, the response rate of this study was deemed sufficient for data analysis.

Accidents involving Transport organizations in the County of Nairobi

The findings revealed that during the period of 2022/2023, all the transport organizations that were part of this study had been involved in accidents. On average, the transport organizations reported a mean of 79 accidents. Among these organizations, the one with the fewest accidents recorded a total of 9, while the organization with the highest number reported 178 accidents. The accidents included both minor incidents and major collisions, demonstrating a broad spectrum of severity.

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This data underscores the significant involvement of public transport organizations in accidents, affirming observations made in a report by KHA in 2023. The report states that a considerable proportion of accidents in Kenya are associated with vehicles operated by public transport organizations. This evidence highlights the pressing issue of road safety related to public transport and the need for further investigation and potential interventions to improve safety measures within this sector.

E-Transport and Safety Performance of Transport Organizations in the County of Nairobi

Descriptive statistics

The study found that transport organizations have adopted digital transport management tools to a different extent. Various organizations have adopted digital tools. For instance, 98 percent of transport organizations in this study reported having embraced digital payments; while 41% of the transport organizations have adopted mobile based booking operations. Additionally, 36% and 31% of the transport organizations have embraced use of parcel management systems and web based fleet management systems. The results of this analysis are as shown on figure 1.

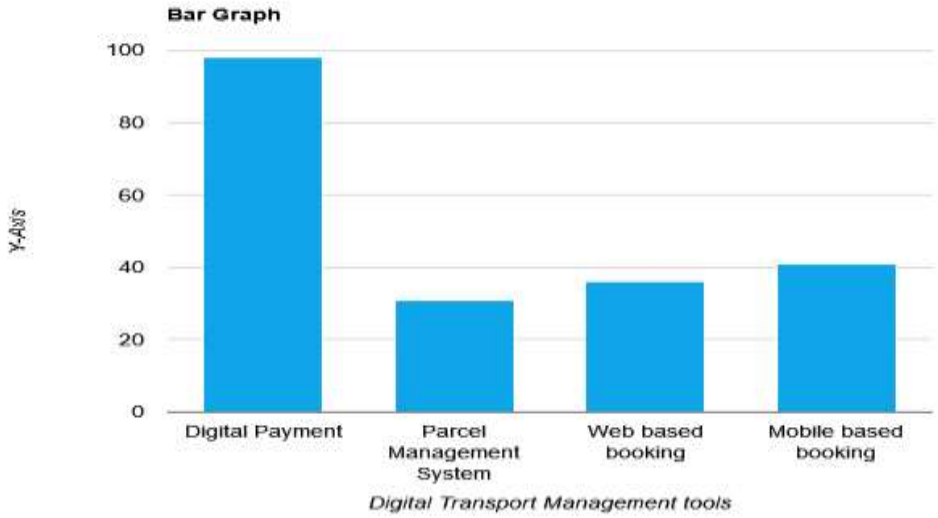

Figure 1: Adoption of Digital Transport Management Tools

A limited number of organizations have embraced a broad range of digital tools, while the majority have chosen to implement only digital payment systems. This supports the viewpoint of Akkerman

et al. (2019), who argue that digital tools are becoming increasingly important for transport management across Africa. However, a detailed examination of how transport organizations in Nairobi are adopting these digital tools reveals that the adoption is quite superficial. Most of the tools that have been implemented primarily focus on managing customer interactions. There is a notable absence of integrative tools that would allow for the effective management of other vital areas within transport operations, such as route planning and optimization. For example, not a single organization has incorporated a fleet management system, which is crucial for efficient vehicle operation and logistics.

In addition to examining the tools being adopted, the study also sought to identify the benefits that organizations experience from implementing these digital tools. Organizations that have adopted certain digital technologies reported various positive outcomes depending on the specific tools in use. For instance, many noted enhanced revenue visibility, which enables them to track earnings more effectively. Improved customer service and customer retention were particularly highlighted by organizations that permitted online booking through websites or mobile applications. These features increase convenience for customers and often lead to more satisfied clients. Additionally, organizations that have put into place parcel management systems, complete with tracking capabilities, saw an increase in parcel customers. This development fosters greater customer confidence, facilitates retention, and ultimately boosts profitability in that segment of their transport operations. This finding aligns with the observations made by Heinbach et al. (2022), who describe how digital technology in road freight management enhances visibility of processes, allows for better optimization, and provides analytical insights.

An analysis of data gathered from various public transport organizations indicated that only 31% of these organizations had achieved what can be categorized as the highest level of digitization, which is around 40%. The other organizations displayed varying levels of digitization, ranging from 10% to 30%. This data illustrates that public transport organizations have a long way before reaching high levels of digitization in their operations, indicating a significant opportunity for improvement in this area.

Inferential Statistics

The study hypothesized that E-transport Management does not have a significant effect on safety performance of public transport organizations in the County of Nairobi. The study used the regression model; $Y= \beta 0+ \beta 1X1+\varepsilon$; Where; Y = safety performance of the public transport organizations; $\beta 0$ = constant (coefficient of intercept); X1 is E-transport Management; and $\beta 1$, is the regression coefficient of E-transport Management. The analysis revealed the following statistics as shown in Table 2.

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Table 2: E-Transport Management and Safety performance

R-Squared	P-value
.859	.000
co-efficient: B, 131.951, X1, -2.723	

These results reveal that Digitization of transport operations has a significant effect on safety of public transport organizations. The resultant regression Model was described as: $Y= 131.951-2.723X_1+\varepsilon$, this implies that a percentage increase in level of digitization of transport operations results in 2.723 reduction in accidents involving public transport organizations in the county of Nairobi. These findings agree with Vasilenko et al (2021) who espoused that digital technologies creates data to empower managers to efficiently manage various aspects of transport operations; which contributes to reducing the level of accidents involving the fleet.

Discussion

The findings of the study indicate that the uptake of digital tools within the management frameworks of transport organizations in Nairobi County is limited. This observation aligns with the perspective presented by Akkerman et al. (2019), who suggest that while digital tools are increasingly becoming important for transport management across Africa, the rate of their adoption varies significantly from one location to another. The research highlights that different transport organizations have embraced digitization to different extents, illustrating a diverse landscape in the implementation of these technological solutions.

Moreover, the study identifies a noteworthy correlation between the digitization of transport operations and the safety performance of public transport organizations in Nairobi County. This correlation supports the arguments made by Heinbach et al. (2022), who assert that the application of digital technologies generates valuable data for transport managers, thereby facilitating more effective operational strategies. Such advancements in digital engagement can enhance safety performance, which is a critical aspect of public transport services.

It is particularly noteworthy that public transport organizations prioritize the integration of digital payment systems and enhance other areas related to customer interaction. Despite this focus, they seem to overlook essential components of transport management, such as the digitization of vehicle and crew management. This area represents a significant opportunity for growth within the transport organizations in Nairobi County. By adopting digital tools for these purposes, they could potentially unlock additional benefits that go beyond the advantages already recognized through their current digital initiatives.

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Interestingly, the shallow adoption of various digital tools by many transport organizations raises questions about their overall digital strategy. The primary motivation for the adoption of digital payment systems appears to be the enhancement of revenue collection processes. Understanding the factors that drive the adoption of digital tools in these organizations could provide valuable insights into their operational dynamics and help identify potential areas for improvement.

Fleet Maintenance and Safety Performance of Transport organizations in the County of Nairobi

Descriptive Statistics

The examination of fleet maintenance practices indicates that different organizations adopt various strategies when it comes to the upkeep of their vehicles. Out of the 42 transport organizations included in this study, only 13 have established a defined fleet management schedule as outlined by a Sacco, showcasing a significant gap in systematic maintenance planning. The remaining organizations have chosen not to implement any formal maintenance schedules. Instead, the responsibility for conducting vehicle upkeep is largely left to individual vehicle owners, which can lead to inconsistencies and potentially neglectful practices. Furthermore, only 13 out of the fleet organizations prioritize pre-trip and post-trip inspections for their vehicles. This lack of attention to regular inspections and structured maintenance reflects an overall disregard for proper vehicle care within these transport organizations. Such findings resonate with the observations made by Aflabo et al. (2020), who highlighted similar issues within the Ghanian transport sector, indicating a broader concern regarding vehicle maintenance oversight. The results of the analysis is provided in Table 3

Table 3: Vehicle Maintenance Mechanisms

Sacco defined Maintenance	Owner Defined Maintenance	Pre-post Trip Inspection
13 Trans. Orgs.	29 Transport Orgs.	13 Transport Orgs.

The study analysis further reveals that 29 organizations do not conduct periodical fleet inspection to ascertain the condition of vehicles of the fleet, and their appropriateness. Only 13 transport organizations conduct fleet assessment per month.

Inferential Statistics

The study sought to examine the hypothesis that: Fleet Maintenance has no significant effect on safety performance of public transport organizations in the county of Nairobi. The study examined the data on accidents involving public transport organizations, and on fleet maintenance. Using the regression model: $Y= \beta0+ \beta1X1+\varepsilon$; Where; Y = safety performance of the public transport organizations; $\beta0$ = constant (coefficient of intercept); X1 is fleet maintenance; and $\beta1$, is the

regression coefficient of fleet maintenance; the analysis yielded the following statistics shown on table 4.

Table 4: Fleet Maintenance and Safety Performance.

R-Squared	P-value
.780	.000
co-efficient: B, 99.9, X1, -26.811	

These results mean that Fleet maintenance, depicted by number of vehicle inspections per month significantly contributed to improved safety performance and thus the null hypothesis is rejected. These results auger well with the findings of Pastillos, Marcos and Parlikad (2023) who proposes that predictive maintenance models used in preventive maintenance extends the useful life of rolling stocks. In this scenario, strategy to examine conditions of vehicles could be a potent input into preventive maintenance strategy and thus improve fleet safety performance. The resultant regression model becomes: $Y= 99.9-26.8X1+\varepsilon$; which means that an increase in number of inspection checks per month, results in reduction of accidents involving the fleet by 26.8 accidents. Therefore, fleet inspection could be viewed as a potent strategy contributing to the fleet safety performance.

Discussion

The study clearly establishes that the maintenance of a fleet plays a crucial role in ensuring the safety performance of vehicles. It highlights a significant concern within transport organizations in Kenya, which reflects broader trends observed throughout Africa, as noted by Aflabo et al. (2020). Many of these organizations do not prioritize vehicle maintenance as a key factor in promoting fleet safety. This lack of priority is demonstrated by the fact that only a small number of organizations, specifically thirteen, maintain a fleet maintenance schedule that is directly managed by the transport organization itself. In contrast, the majority of fleet organizations have chosen to delegate the responsibility of vehicle maintenance to individual vehicle owners.

This delegation of responsibility can lead to a troubling situation. Vehicle owners may prioritize maintenance based primarily on their available financial resources, rather than viewing maintenance as essential for safety. This financial perspective could lead to unpredictable servicing; vehicles might be maintained only when funds permit, rather than following a disciplined, scheduled approach aligned with the needs identified through regular fleet inspections. This practice stands in stark contrast to the recommendations put forth by Rawat and Lad (2017), who advocate for a shift away from traditional fleet maintenance strategies based solely on the level of repair needed. Instead, they encourage organizations to adopt a more practical approach

that emphasizes preventive maintenance based on the time-dependent failure rates of vehicle components.

Moreover, the study reveals that many organizations neglect to carry out mandatory inspections before and after trips. This lack of proactive assessment indicates that numerous fleet organizations lack sufficient visibility into the condition of their vehicles. Consequently, they may struggle to accurately determine whether a vehicle is suitable for a trip or if repairs are necessary. This oversight can prevent organizations from taking effective measures to enhance and ensure the safety of their fleets. The implications of the analysis shed light on the alarming state of disrepair prevalent among many public service vehicles. Reports from police officials indicate that a frequent cause of accidents involving public service vehicles is their un-roadworthy condition. A notable example is provided by Njeru and Marete (2022), who documented an incident in which a public service vehicle was involved in an accident resulting in over 34 fatalities. Initial investigations revealed that the bus had embarked on its journey despite having known mechanical issues. Such incidents often occur when transport organizations fail to implement proper maintenance schedules and adequate fleet inspection strategies.

Fleet Monitoring and Safety Performance of Transport organizations in the County of Nairobi

Descriptive statistics

The analysis of the study indicates that a total of 13 organizations, which represents 31% of the total transport organizations surveyed, utilize a variety of mechanisms to effectively monitor their fleet operations. These mechanisms include a feedback system based on social media, GPS tracking technology, route supervisors, and toll-free numbers available in the vehicles. These 13 transport organizations harness the capabilities of social media to collect feedback from users regarding the performance of their crew and the condition of their fleet. Additionally, GPS tracking is employed for real-time monitoring of fleet vehicles, which is particularly useful in ensuring compliance with government regulations related to speeding. This capability allows the organizations to maintain high standards of safety and adherence to traffic rules.

Furthermore, the transport organizations provide toll-free numbers inside their vehicles, enabling passengers and the public to report any issues or concerns directly to the company. In addition to these technological solutions, these organizations also deploy route supervisors who play a crucial role in overseeing the daily operations of the fleet. These supervisors are responsible for monitoring factors such as overloading of vehicles, adherence to designated routes, and compliance with government regulations regarding the behavior and appearance of drivers. The findings of this study align with the conclusions drawn by Tembe (2023), who observed that public

transport organizations are increasingly implementing effective monitoring strategies for their fleets, leading to noticeable success. This suggests a growing trend within the industry toward adopting various monitoring mechanisms to enhance the overall efficiency and safety of transport services.

Inferential Analysis

The study hypothesized that fleet monitoring has no significant effect on safety performance of transport organizations in the County of Nairobi. Data collected was analyzed using regression analysis guided by the following model: $Y= \beta 0+ \beta 1X1+\varepsilon$; Where; Y = safety performance of the public transport organizations; $\beta 0$ = constant (coefficient of intercept); X1 is fleet monitoring; and $\beta 1$, is the regression coefficient of fleet monitoring; the analysis yielded the following statistics shown on table 5.

Table 5: Regression Analysis of Safety Performance on Fleet Monitoring

R-Squared	P-value
.788	.000
co-efficient: B, 105.6, X1, -68.639	

These results mean that Fleet Monitoring has a significant effect on safety performance of transport organizations (P Value-0.000). Therefore the study rejects the null hypothesis and concludes that fleet monitoring has a significant effect on safety performance of transport organizations in the County of Nairobi. The resultant regression Model could be written as: $Y= 105.6-68.639+\varepsilon$; which implies that presence of route supervisors results in reduction of number of accidents by 68.639. This means that organizations that employ route supervisors experienced reduced number of accidents than those organizations that don't employ route supervisors. These findings auger well with finding of Mazinga (2020) that links fleet monitoring to improved fleet efficiency.

Discussion of Analysis

The study highlights that a limited number of transport organizations have implemented fleet monitoring systems. These systems include the utilization of social media platforms and toll-free numbers, which serve as effective tools for collecting user feedback regarding crew discipline and addressing complaints. By adopting these methods, fleet managers are better equipped to oversee their fleet operations comprehensively. For example, these organizations can closely monitor incidents of customer harassment, driver indiscipline, excessive speeding, and reckless driving behavior. Such monitoring is crucial because these factors are directly tied to the overall safety performance of the fleet, a connection that this study has thoroughly established. The findings of

this research reinforce the arguments put forth by Tembe (2023), who asserts that monitoring mechanisms are essential for transport managers to maintain control over the various operational aspects of their fleets. This control is vital for achieving fleet efficiency. In Kenya, these monitoring mechanisms have been implemented multiple times to ensure the safety and orderliness of public transport organizations.

A notable example is provided by Ndunda (2021), who reports on an incident involving a driver from a Nairobi-based transport organization. This driver was held accountable for dangerous driving practices, thanks in large part to a video that a road user posted on social media, enabling swift action to be taken against the driver. Furthermore, the presence of route supervisors plays a significant role in enhancing safety. These supervisors conduct random inspections of vehicles while they are in operation, which helps deter issues such as overloading and other hazardous behaviors that could compromise road safety. As a result, organizations that employ route supervisors often see improved compliance with regulations and, consequently, better safety performance overall. This comprehensive approach to monitoring and oversight significantly contributes to creating a safer and more efficient public transport environment.

Fleet Technical Capacity and Safety performance of Transport Organizations in the County of Nairobi

Descriptive Analysis

The analysis of data concerning fleet technical capacity indicates that all fleet organizations identify class endorsement and police clearance as fundamental prerequisites for both employment and the issuance of public service licenses. This requirement ensures that candidates meet basic legal and safety standards before taking on significant responsibilities. Nevertheless, it is noteworthy that only 31% of the transport organizations impose any additional qualifications for their crew members as a condition of employment. In these organizations, drivers and crew are expected to obtain qualifications in several key areas, including defensive driving, health and safety protocols, and basic mechanics. This framework aims to enhance the skills and preparedness of the crew, ensuring they can perform their duties effectively and safely.

Further examination of the data reveals that a mere 31% of these transport organizations actively organize capacity-building training for their crew. Within this subset of organizations, some arranged a minimum of one training session during the study period, while others facilitated up to four training sessions within the year. The topics addressed in these training sessions encompassed a range of vital areas, such as road rules and regulations, refresher courses on driving skills, safety and first aid instruction, customer service techniques, and updates on new transport technology and infrastructure.

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These insights align closely with the findings of Sangrar (2019), which also highlighted that prevalent capacity-building strategies within transport organizations typically include a combination of classroom instruction and in-vehicle training programs. Such programs are specifically designed to improve the driving experience of older drivers, focusing on enhancing their confidence, familiarizing them with new technologies, ensuring they understand relevant laws, and ultimately reducing the likelihood of accidents. This comprehensive approach to training and development is essential for maintaining safety and efficiency within the transport sector.

Inferential Analysis

The study sought to examine the hypothesis that fleet technical capacity has no significant effect on safety performance of transport organizations. The study regressed data on number of accidents involving transport organizations on data on number of training programs offered in the year under study. The study used the following regression model: $Y= \beta0+ \beta1X1+\varepsilon$; Where; Y = safety performance of the public transport organizations; $\beta0$ = constant (coefficient of intercept); X1 is fleet technical capacity; and $\beta1$, is the regression coefficient of fleet technical Capacity; the analysis yielded the following statistics shown on table 6

Table 6: Regression Analysis of Safety Performance on Fleet Technical Capacity

R-Squared	P-value
.824	.000
co-efficient: B, 100.8, X1,-27.8	

These results indicate that Fleet technical Capacity (Training Programs), have a significant and substantial effect on the safety performance. These results yield the following regression model: $Y= 100.8-27.8X1+\varepsilon$. This means that a unit increase in number of training programs results in reduction of accidents by 27.8 units. This translates to imply that training programs for crew result in improved safety performance. This augers well with the findings of Niekerk et al (2019) that established that safety incentivisation, vehicle modification, and driver training results in better safety performance.

Discussion on Analysis

The findings from this study reveal that crew training plays a crucial role in enhancing the safety performance of transport organizations operating in Nairobi County. This aligns with previous research conducted by Niekerk et al. (2019), which established that when drivers receive thorough training, particularly focused on safety protocols and practices, it results in marked improvements in the safety performance of vehicle fleets. The current study observed that a significant number of transport organizations tend to implement only the bare minimum qualifications for their fleet drivers. Furthermore, it was noted that most organizations do not prioritize developing capacity-

building training programs for their crew members. This lack of investment in comprehensive training may help explain the overall safety performance issues within transport organizations in Nairobi County. As highlighted by Kinyajui (2024), a notable proportion of road transport accidents in Kenya can be linked to public transportation vehicles, underscoring the critical need for improved safety measures.

One of the underlying reasons for these safety challenges could be the low qualification requirements that many transport organizations enforce. Their focus primarily appears to be on satisfying government regulations rather than improving the skill levels of their drivers. The evidence suggests that transport organizations would significantly benefit from raising their standards regarding crew qualifications. By requiring a higher level of expertise and investing in extensive training programs for their crew members, these organizations can enhance their safety capabilities. Ultimately, this would contribute positively to the overall safety performance of public transport systems in Kenya.

CONCLUSIONS

E-transport and Safety Performance

The study highlights that digitizing transport processes plays a crucial role in influencing safety outcomes on the roads. However, the research also notes a concerning trend: there is only a minimal level of adoption of e-transport tools among public transport organizations. When examining the types of e-transport tools that have seen adoption, the study identifies that the most prevalent forms involve the digitization of revenue-related processes. This includes the use of mobile money systems that enable users to pay for transport services and make bookings remotely. Such developments indicate a shift towards more convenient payment methods that align with modern consumer expectations. In contrast, the study reveals that few organizations have extended this digitization to parcel services, indicating a gap in the broader application of technology within the transport sector. Moreover, only a limited number of other transport processes have been digitized at this time, showcasing a lack of widespread innovation in this area.

The research suggests that the growing adoption of digital payment and booking systems is closely linked to the rising popularity of mobile money services in Kenya. This trend is not only a response to consumer demand but also an essential strategy for public transport organizations to effectively manage and increase their revenue streams. Despite these advancements in payment and booking systems, it appears that public transport organizations have not prioritized the digitization of their operations to enhance the safety of transport processes. The study implies that there is minimal incentive for these organizations to adopt further digital solutions aimed at improving safety measures. Additionally, a lack of awareness about the potential benefits of digitization in

enhancing safety and efficiency may contribute to this situation. Overall, the study paints a picture of a sector at a crossroads, where the opportunity for improvement exists but is not fully realized.

Fleet Maintenance and Safety Performance

The study found a notable connection between fleet maintenance practices and the safety performance of public transport organizations operating within Nairobi County. It was observed that many public transport entities have not effectively managed their fleet maintenance responsibilities. Instead, these organizations tend to pass this critical function to individual vehicle owners. This delegation often results in insufficient motivation among these owners to maintain vehicles, as their interests may not align with achieving high safety standards and performance. The consequences of this are clearly visible in the poor condition of many public transport vehicles, which often show signs of neglect and deterioration. In contrast, there are some public transport organizations that have put in place structured and routine fleet maintenance schedules.

These organizations demonstrate a commitment to ensuring that their vehicles are kept in good operational condition. As a direct result of these proactive measures, they experience fewer accidents and incidents. This reinforces the idea that effective maintenance practices can significantly influence safety outcomes. Furthermore, the study highlights a concerning trend among most public transport organizations in Nairobi County: a lack of pre-trip and post-trip vehicle inspections. This absence of regular inspections means that these organizations are unable to accurately assess whether their vehicles are suitable for safe transport operations. Without proper evaluations, they cannot identify the need for necessary repairs or maintenance, which poses serious risks to both the passengers and the overall safety of the public transport system. This underscores the critical need for enhanced maintenance practices and regular vehicle assessments to improve safety in public transport operations.

Fleet Monitoring and Safety Performance

The study investigated the impact of fleet monitoring on the safety performance of public transport organizations in Nairobi. It was found that the presence of route supervisors plays a crucial role in enhancing safety measures within these organizations. However, the findings indicate that only a small number of transport companies have adopted effective fleet monitoring mechanisms. These mechanisms include the use of social media feedback systems, GPS tracking, toll-free numbers for reporting concerns, and the employment of route supervisors. Among the few organizations that have implemented these techniques, social media platforms are utilized to gather feedback from passengers about both the crew and the vehicles. This feedback serves as a valuable tool for improving service quality and addressing safety issues. Additionally, GPS tracking systems allow for real-time monitoring of vehicle speed, ensuring that drivers adhere to government regulations regarding safe driving practices.

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Transport companies also provide toll-free numbers in their vehicles, enabling passengers to report any safety concerns or issues they experience without facing any financial burden. Furthermore, these organizations employ route supervisors who are responsible for overseeing the operations of the fleet. The supervisors monitor various aspects, including passenger overloading, adherence to designated routes, and compliance with government regulations related to driver attire and road usage. The study concludes that public transport organizations that employ a diverse range of fleet monitoring techniques are more likely to achieve favorable safety performance outcomes. In contrast, it emphasizes that the majority of transport organizations currently lack adequate visibility and control over their fleet of vehicles. This limited oversight can hinder their ability to ensure the safety of their operations and meet regulatory standards.

Fleet Technical Capacity and Safety Performance.

The study concludes that the technical capacity of a fleet has a significant impact on the safety performance of public transport organizations. This finding emphasizes the crucial role that well-equipped and properly trained personnel play in ensuring safe transport operations. Despite this important connection, the research highlights that only a small number of public transport organizations actively design and implement programs aimed at enhancing the skills and capacities of their crew members. The training programs that do exist within these organizations typically encompass a range of essential topics. These include safety protocols, regulatory compliance, advancements in technology relevant to transport, and refresher courses focused on driving skills. Such comprehensive training is vital in preparing crew members to handle various situations they may encounter on the road. Notably, organizations that prioritize and implement these training programs tend to experience a significant reduction in the number of accidents compared to those that do not invest in crew training. This correlation underscores the importance of ongoing education and skill enhancement in promoting safer driving practices.

Furthermore, the study reveals that the majority of public transport organizations set only minimal qualifications for their fleet drivers. This approach to hiring and training may contribute to the overall safety challenges faced by transport organizations within Nairobi. It becomes evident that many road transport accidents in Kenya can be attributed to driver errors, which include common issues such as speeding, overloading of vehicles, improper use of roadways, failure to adhere to road signs, and lack of lane discipline. These factors collectively highlight the pressing need for improved training and qualifications for drivers, which could lead to enhanced safety and a reduction in the number of traffic incidents in the region.

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Recommendations

Recommendation to Stakeholders in Public Transport

The study has successfully identified that various transport management practices, specifically E-transport Management, fleet maintenance, fleet monitoring, and fleet technical capacity, play a crucial role in influencing the safety performance of public transport organizations. These practices are essential for ensuring that transportation services operate efficiently and remain safe for passengers. However, the findings also highlight a critical issue: public transport organizations have only minimally adopted practices that can significantly improve safety. For instance, the level of digitization within these organizations is surprisingly low, indicating that many are falling behind in modern technological advancements that can enhance safety. Furthermore, the use of mechanisms related to fleet maintenance and monitoring is virtually nonexistent, which poses a risk to the overall safety of public transport operations. This lack of attention to maintenance and monitoring can lead to mechanical failures and safety incidents that endanger passengers and drivers alike.

In addition to these challenges, the transportation organizations studied exhibit very low qualification criteria for their fleet crew. This lack of rigorous standards means that individuals responsible for operating and maintaining the vehicles may not possess the necessary skills or knowledge to ensure safe and effective transportation services. Compounding this issue is the absence of capacity-building activities designed to improve the qualifications and skills of the fleet crew. Without proper training and development opportunities, employees may not be adequately prepared to handle the complexities and challenges of their roles, further compromising safety. In light of these findings, the study strongly urges stakeholders—including government agencies, public transport managers, and organizational leaders—to develop and implement strategies aimed at enhancing the adoption of safety-improving practices within public transport organizations. By doing so, these stakeholders can significantly reduce the frequency of accidents involving public service vehicles, many of which are linked to poor compliance with safety regulations, ineffective monitoring and control systems, inadequate vehicle maintenance, and driver errors. Taking decisive action in these areas is essential for ensuring safer public transport for all users.

Further Research

The research conducted aligns well with the existing body of literature on transport management practices and their effects on the performance of fleets. This study adds valuable evidence regarding fleet management techniques specifically related to public service vehicles within Kenya. Furthermore, it contributes insights that are relevant not only to Kenya but also to many other developing nations facing similar transportation challenges. As such, this research enhances

the understanding of effective transport management practices and their correlation with safety performance in the public transport sector. One of the key findings of the study is the observation that there is a minimal or shallow adoption of established transport management practices among public service vehicle operators. Despite the availability of effective strategies that have been shown to improve safety and reduce the incidence of accidents, these practices are not being implemented to a significant degree. The study does not, however, explore the underlying causes of this limited adoption of transport management practices.

Consequently, this study emphasizes the need for further investigation into why these practices are not being embraced more fully. It calls upon scholars and researchers to explore this issue in greater depth, aiming to uncover the barriers that may be hindering the adoption of effective transport management practices. By doing so, the research can contribute to the accumulation of evidence that supports the implementation of these practices, which are crucial for enhancing safety and reducing accidents involving public service vehicles. Such insights could ultimately lead to improved transport safety standards and better overall fleet performance in Kenya and similar contexts within developing nations.

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