TECHNOLOGY APPLICATION EFFECTS ON MAINTENANCE EFFICIENCY OF THE FLEET AT THE PARLIAMENTARY SERVICE COMMISSION, KENYA

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ABSTRACT

Transportation is an important part of any economy and has a direct effect on how a country grows and develops. While the private sector's focus across the world is maximizing profits and gaining a competitive advantage in and through transportation, the public sector's attention is on the provision of efficient, effective transport services while guaranteeing prudent use of public resources in all transportation processes. The efficiency and effectiveness of fleet management in public institutions depend on how well the fleets are supervised and managed. This study sought to establish how the application of technology affects the maintenance efficiency of the fleet. The study exploited a descriptive research design with a population of one hundred and seventy-five and a sample size of one hundred and thirty-five selected through a stratified sampling technique. The study adopted a quantitative research method where Questionnaires were used to collect data, which was presented in tables and pie charts. Statistical Package for Social Sciences (SPSS) was used to conduct descriptive analysis (mean and standard deviation.). For data collected, content analysis was used. Pie charts, frequency tables, and percentages were used to present the findings. The study ensured that the ethical standards of confidentiality, objectivity, informed consent, and anonymity were upheld. This study provides valuable insights into the impact of technology adoption on the Parliamentary Service Commission's transport services. The findings demonstrate that fleet management technology has enabled improved vehicle servicing through reduced costs, simplified mileage tracking, and higher maintenance quality, and despite the technology being easy to use, challenges like system failures were noted, indicating a need for enhanced IT.

Keywords: Technology Utilization, Maintenance Efficiency, Parliamentary Service Commission, Kenya.

INTRODUCTION

Background to the Study

The transportation industry has evolved in numerous ways due to recent developments. This sector has grown faster than expected in recent decades (Mohamed & Jokonya, 2021). The need for both commercial and public transportation is high. It is owing to market improvements in several areas such as production, manufacturing, e-commerce, retailers, wholesalers, and third-party fleet management providers. The transportation and fleet management sector contributes significantly to the global economy and is vital in any country at the national and local levels (Bakir, 2017).

Information technology (IT) is prominently acknowledged as a fundamental component of change processes in this sector. Through IT, the capacity to monitor and regulate the transition of motor vehicles, as well as the personnel involved in fleet management, promptly and effectively could save organizations a good proportion of the budget. To guarantee that a company is functioning efficiently, the costs of gasoline, maintenance, and service costs, as well as the overtime of personnel, can be continuously monitored and checked.

The Government of Kenya released the Kenya Vision 2030 with a clear goal of promoting innovation in delivering services in the public sector as a precursor for global competitiveness and prosperity in 2009 (Sawe & Cheluget, 2020). According to Sawe and Cheluget (2020), the government sought to establish and execute a policy framework for STI to back up the Vision 2030. Furthermore, the Constitution of Kenya (2010) in Articles 10 and 232 pronounces and demands for public service delivery that meets the needs of the citizens. It necessitates originality and ingenuity. As a result, since 2006, the government has worked hard to bring innovation to the public sector and make people aware of it (Tokundu, 2021). According to Sawe and Cheluget (2020), the government introduced results-oriented management and recognized performance contracting as one of the ways to improve service delivery in 2008.

The transportation industry in Kenya contributes 8.4% to the country's GDP. Matatus, taxis, bodabodas, and tuk-tuks make up the road transportation network and are privately operated. Transportation in Kenya is accomplished by land, sea, and air in order to support the country's economic activities. More than 82% of travel and 78% of cargo are carried by roads (Kenya Roads Board). To get from Mombasa to Naivasha on time, Kenya built a standard gauge railway. This was part of the country's plan to realize its Vision 2030.

Mutungi *et al.* (2019) argue that the primary objective of technology uptake is operational efficiency, a goal for many technological efforts and execution. The efficiency in operation is manifested in the development and/or provision of services in a cheaper, faster, accurate, and timely (prompt) manner. It also targets minimal consumer complaints, if any. For specific applications or systems, operational efficiency benefits may be the only requirement and reason for investment; nonetheless, user satisfaction is always vital. As a result, operational efficiency will require aspects such as process streamlining, team feedback, technological innovation, and the use of metrics (Mutungi *et al.*, 2019). Continuously improving these processes can increase operational efficiency and keep the government focused on innovation (Kim et al., 2020). Transportation significantly impacts economic growth and job creation in modern society.

Statement of the Problem

The efficiency of any government institution in transport and transportation services depends on how well the fleet is managed, supervised, and discharged for duty. There is a need not only to

manage and reduce costs but also to become efficient without compromising the quality of service. Due to competition in the industry and for resources, many institutions have trained their focus on achieving excellent performance and keeping their customers (Njeru, 2018). Constant technological advances could impact fleet management firms' performance in terms of revenue, expenses, and client satisfaction. Every day's rising transaction volume adds to fleet management firms' difficulties in expanding and fulfilling their obligations, regardless of how much money they make (Kim *et al.,* 2020). Dickens and Simon (2021) opine that in determining the adoption of IT for its merits and despite the insecurity and risks it portends, the level of technology given is less of a worry than 'how well' the potential users are served. Therefore, this study's overarching goal is to fill in the blanks about the effects of technology application in fleet management that would persuade Kenya's public sector to adopt technology in fleet management.

Study Rationale

There has been increasing demand for transport services in the public sector. The efficiency and effectiveness of running fleets of vehicles have been low, while the cost of providing these services is high. The application of technology in fleet management is relatively new, especially for the public sector organizations and departments. Many institutions have not adopted technology because of the perceived negative effects, the attitude of the staff to buy into the use, and, more critically, the cost of implementation has been considered high. However, the traditional manual management of fleets remains an avenue for leakage, pilferage of fleet resources, inconsistencies in records management, inefficient maintenance schedules, as delays in provision of the transport service when required. The study is conceptualized as such because technology adoption in the public sector has taken off in earnest, and efficiencies associated with technology application have been proven in other sectors and functionalities. Therefore, there is a need to find out and determine if the application of the same in the management of the transport function at the PSC is worthwhile, specifically in the efficiency of the service, the maintenance of the fleets, as well as the associated costs.

Empirical Literature

Fleet management has become essential in many industries, including government and local authorities (Akkartal & Aras, 2021). Regardless of the size of fleet vehicles, companies are expected to conduct certain fleet operations from when the vehicles are purchased to when they are disposed of. These operations include maintenance and repair management, driver assistance, tire replacement, replacement vehicles management, accident management, road assistance, and other services such as toll management and vehicle inspections (Gitahi & Ogollah, 2014). In the past, many private and public organizations have purchased and managed their fleet. However, in the recent past, many companies have opted for leasing contracts that cover full-service for vehicles, aimed at minimizing the running costs for fixed assets (Gitahi & Ogollah, 2014).

Consequently, there is a new trend of companies outsourcing their fleets to external fleet management service providers to achieve cost reductions (Deloitte, 2017). In recognition of their responsibilities, fleet management companies seek new ways to improve efficiency and flexibility and reduce operational costs (Uyttebroeck, 2020).

According to Uyttebroeck (2020), efficiency is achieved through optimal vehicle utilisation while keeping costs low. Efficient fleet operations require better advance planning. Planning aims to ensure that the chosen routes provide the highest vehicle utilisation, serve as many customers as possible, deliver the largest amount of goods, and minimise delivery times (Jonsson,2021). Advanced planning recognises and considers factors beyond company control, such as road and traffic conditions, in coming up with the most efficient routes.
Akkartal and Aras (2021) opine that sustainability has become a major concern in fleet management and can be considered using either economic or environmental perspectives. From the economic perspective, fleet management aims to achieve optimal operations at minimal costs, and it is the ability of the company to make decisions that minimises operational costs throughout a vehicle's life cycle (Akkartal & Aras, 2021). The decisions ranging from fleet purchase to disposal have a lot of financial implications, and the companies must consider the total cost of ownership to identify cost-saving potential and minimise operational costs (Deloitte, 2017). Aflabo *et al. (*2020) suggest that the fuel management of any vehicle can be area where operational costs of such a vehicle can be reduced. The cost of fleet fuel is determined by the level of transparency between procurement and consumption, where an absence of transparency portends high procurement costs and low vehicle utilisation.

The use of technology is essential for improving the overall efficiency of transport services, and maintaining the technology is equally important to ensure that it continues to function optimally. The Parliamentary Service Commission (PSC) is responsible for overseeing the administration of parliamentary services in Kenya, including the transport services provided to Members of Parliament and staff (Gitahi & Ogollah, 2014). In recent years, the PSC has been exploring ways to improve the efficiency of its transport services through the use of technology (Akkartal & Aras, 2021). For example, the PSC has been considering the use of GPS and RFID technology to track the movement of vehicles and goods, as well as the use of enterprise resource planning (ERP) systems to streamline its administrative processes. The use of such technology can help to improve the efficiency of the transport services provided by the PSC.

It is important to note that the use of technology alone is not sufficient to ensure the efficiency of transport services. It is equally important to maintain the technology effectively to ensure that it continues to function optimally (Rastrict & Corner, 2010). This includes regular maintenance, upgrades, and repairs as needed, as well as ongoing monitoring and evaluation to identify and address any issues that arise. Fleet availability is one of the key elements of any efficient and

effective fleet management. The use of technology gives visibility in fleet maintenance, which leads to reduced vehicle downtime.

Theoretical Framework

Technological, Organizational, and Environmental (TOE) Framework

The TOE framework comprises three constructs that determine technology adoption in an organization, including technological, organizational, and environmental contexts (Mohamed & Jokonya, 2021). The technological context comprises the technologies that have already been adopted by the firm and those still available in the market but not in use (Bakir, 2017). The adoption of technologies may either cause an incremental or discontinuous change in an organisation. As a result, an organisation must consider the type of desired change when adopting new technologies, as some technologies may dramatically impact the firm while others will have a minimal impact.

The organisational factors refer to an organisation's resources and characteristics, including management, intercommunication processes, organisational size, structure, and resources (Bakir, 2017). Organisational size and lack of resources have been identified as critical factors largely responsible for technology adoption by organisations. Larger firms are more likely to adopt technologies faster than smaller firms while the availability of resources has been noted to increase a firm's technology adoption level (Muriithi *et al.*, 2016).

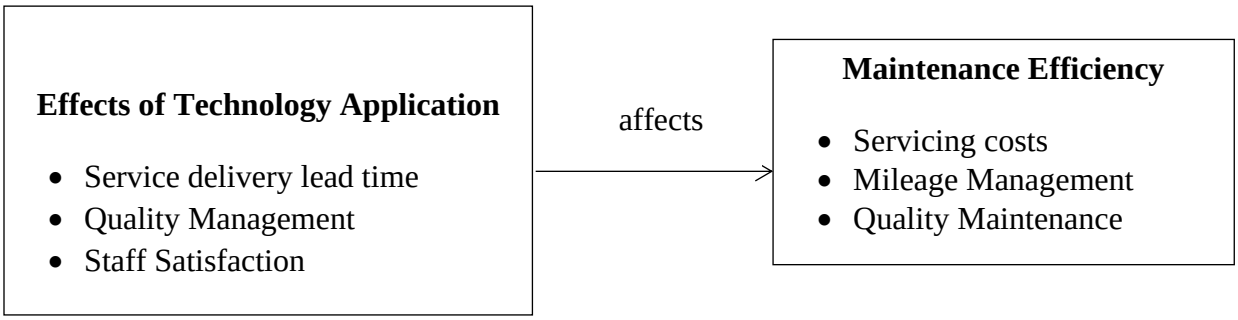
The environmental context of framework includes government regulations, the availability of technology service providers, and the competitors in the industry. Government regulations may have a beneficial or detrimental effect on technology adoption. Technology adoption becomes mandatory when governments impose constraints such as the requirement for pollution-control devices. On the other hand, stringent testing requirements may lead to a high cost of technology adoption, discouraging organizations from adopting such technologies. Competition within an industry has been noted to intensify the adoption of new technologies as firms seek to achieve and maintain a competitive advantage over other firms (Blichfeldt & Faullant, 2021).

New Public Management Theory

The New Public Management theory was proposed by Christopher Hood (1991) in arguing that public sector practices needed and should be reformed to rhyme with the practice of management in the private sector. The theory places a strong emphasis on efficiency, budgetary control, client service quality, and organizational adaptability. It is conceptualized around performance-based management, rivalry between administrative divisions, and rewards for individual achievement. As a result, centralization, the continuum of politics and administration, prudence, and procedural

accountability are all against the New Public Management philosophy (Vaidya et al., 2018). This theory is applicable in this study in that the PSC will seek to adopt these efficiency and cost-cutting measures in managing their fleet, and that the only way is to adopt technology in the function.

Conceptual Framework



RESEARCH METHODOLOGY

The study used the descriptive research design. The design helped the study get a description of "what exists" in the management of the transport services, the fleet management at PSC, and the adoption and application of technology in the management thereof. The choice of the design was because it would employ quantitative techniques in coming up with its findings. The study was conducted in Nairobi City County, which hosts the capital Centre of Kenya and the Parliamentary Service Commission (PSC). The county has 17 sub-counties, but as a capital city of Kenya, where most, if not all, government agencies, arms of government, and even departments have their headquarters in the City. The study targeted all the 175 individuals involved in the provision, management, and use of transport services within the Parliamentary Service Commission. This included Parliamentary Leadership Office Holders, staff of the Parliamentary Service Commission, transport service providers, and other stakeholders involved in the transport services provided by the PSC.

Primary data was collected using surveys in the form of structured questionnaires. The study used the Google form for drivers and the officers who filled and responded on behalf of the committee members tasked to manage and supervise each spring currently under the conservation strategies. The researcher obtained the necessary permits before commencing the data collection exercise. Kenyatta University's approval of the research proposal was used to apply for a research permit from the National Commission of Science, Technology, and Innovation (NACOSTI). The permit was then used to gain approval for research from the Clerk of the National Assembly and the County Commissioner for Nairobi City County. The questionnaire was then transformed into a Google form.

With the help of Microsoft Excel and Statistical Package for Social Sciences (SPSS), quantitative statistics were analysed using descriptive statistics and inferential statistics. Qualitative data were analysed using content analysis.

Data Findings (Results)

The results revealed a significant gender imbalance among respondents, with 94% being male and only 6% female. This stark imbalance suggests the fleet management roles involving technology use within the PSC remain heavily male-dominated with limited female participation. This finding aligns with the findings by Mohamed and Jokonya (2021) who found that the transportation industry has historically been male-dominated, leading to constrained female participation. They argue that gender stereotypes portray transportation jobs like driving as "men's work," discouraging women from entering the field and consequently proposed the need for targeted policies to promote gender diversity in the industry. The imbalanced survey results reinforce the need for diversity and inclusion efforts to create equal opportunities for women in fleet management positions involving technology use.

Most of the respondents (86%), were aged between 30 and 50 years with only 14% under 30 years old. This indicates the majority of fleet technology users in the PSC fall within experienced middle age groups rather than young entry-level groups. The results are in tandem with what Mohamed and Jokanya (2021) found that age negatively correlates with technology acceptance and adoption. Other research notes this age-based digital divide is lessening as more mature groups use technology. The survey findings demonstrate that fleet technology has gained decent acceptance even among older user groups within the PSC. Targeted training helping users of all ages adjust to new fleet systems may further improve adoption.
Weier (2022) argues that the lack of diversity in terms of gender and age within the respondent pool raises concerns regarding the representativeness of the sample of the entire PSC workforce. In a nutshell, the observed prevalence of male respondents can be linked to the inherent gender distribution within the roles of PSC drivers and officers, which traditionally lean towards male-dominated occupations. This can be attributed to societal norms and historical employment trends. This finding resonates with the literature by Mohamed and Jokonya (2021), noting that transportation has an aging workforce, with the average age of workers increasing. They argued that this can create knowledge gaps as older workers retire (Sifuna, 2021). Furthermore, literature by Alalq *et al*. (2023) highlighted the importance of age diversity, noting that multi-generational teams enhance innovation and new perspectives

On the length of service among respondents, 41% of respondents have served for nine years or more, while 19% each have served in the ranges of 3-5 years and 6-8 years while 21% had served for 2 years or less. The results suggests that a substantial proportion of the respondents have extensive experience in fleet management and transport services within the PSC. It is apparent that

longer-serving employees likely possess in-depth knowledge of the organization's operations, policies, and historical practices. They might have a more profound understanding of the challenges and opportunities associated with technology adoption in this specific context. On the other hand, newer staff with less than three years of service may offer fresh perspectives and potentially be more open to innovative technology solutions. Research by Xu *et al*. (2020) underscores the importance of considering the tenure of employees when implementing technological changes. Longer-serving employees, as found in the study, are likely to possess extensive institutional knowledge and a deep understanding of the organization's history, practices, and operational intricacies (Thomson, 2021).

Maintenance Efficiency

An overwhelming majority of respondents (90%), agree that technology has improved maintenance efficiency in their work. This high level of agreement highlights that technology is widely perceived as a crucial factor in enhancing maintenance practices within the transport services sector of the PSC. Technology plays a significant role in making maintenance processes more efficient (Lim, Zheng & Chen, 2019). Respondents likely believe that technology helps streamline maintenance schedules, automate routine tasks, and facilitate timely repairs and inspections. This leads to improved reliability and longevity of transport assets. Technology's role in streamlining maintenance schedules and automating routine tasks aligns with studies by Lim *et al.* (2019), arguing that Computerized Maintenance Management Systems (CMMS) and asset management CMMS software and technology solutions help organizations plan, track, and optimize maintenance activities, contributing to increased efficiency.

Eighty six percent (86%) of the respondents agreed that the technology has improved maintenance quality in their work. This high level of agreement emphasizes that technology is perceived as a key driver in enhancing the quality of maintenance within the transport services sector of the PSC. Technology is seen as a powerful tool for improving various aspects of maintenance, including preventive measures, timely repairs, and overall quality assurance (Peres *et al.*, 2019). The respondents' strong agreement suggests that they believe technology has significantly contributed to maintaining vehicles and equipment at a higher standard. The role of technology in enabling preventive maintenance through condition monitoring and predictive analytics aligns with a study by Fernandes *et al.* (2021), which outlines best maintenance practices that help organizations identify and address issues before they result in costly breakdowns, thus improving maintenance quality.

Another 86% indicated that the technology has led to reduced maintenance time in their work which underscores the fact that technology is perceived as a critical factor in improving the efficiency of maintenance processes within the transport services sector of the PSC. Technology is seen as a powerful tool for streamlining maintenance tasks, potentially through predictive

maintenance, automated scheduling, and real-time monitoring. The respondents' strong agreement suggests that they believe technology has significantly contributed to reducing the time required for maintenance activities. The findings affirm the idea that technology is a crucial factor in enhancing the quality of decisions related to asset replacement. Research in the field of asset management and replacement strategies by Brynjolfsson and McElheran (2019) emphasizes how technology adoption can lead to improved decision-making through data-driven insights, predictive analytics, and more efficient asset management.

In their work, 83% of respondents agree that technology has led to improved service reliability. These results emphasizes that technology is perceived as a critical driver in enhancing the reliability of transportation services within the PSC. In this context, technology is seen as a powerful tool for improving service reliability, likely through better scheduling, real-time monitoring, and data-driven decision-making. The respondents' strong agreement suggests that they believe technology has significantly contributed to making transportation services more dependable and consistent. The findings corroborate the idea that technology is a crucial factor in enhancing service reliability, aligning with the literature by Johnson *et al.* (2021), emphasizing how technology adoption can lead to improved service reliability through better scheduling, real-time monitoring, and data-driven decision-making.

According to the findings, 82% of respondents indicated that technology has led to reduced breakdowns in their work. This high level of agreement underscores that technology is perceived as a critical factor in improving reliability and reducing the frequency of breakdowns within the transport services sector of the PSC. Technology is seen as a powerful tool for minimizing breakdowns, likely through predictive maintenance, real-time monitoring, and early detection of issues. The respondents' strong agreement suggests that they believe technology has significantly contributed to making the fleet more reliable and less prone to unexpected disruptions. Reducing breakdowns is a critical objective for any organization reliant on transportation services, as breakdowns can lead to service interruptions, delays, and increased maintenance costs (Ali *et al.*, 2021). The research findings confirm the notion that technology plays a crucial role in reducing breakdowns and improving fleet reliability. This resonates with Hernandez *et al.*'s (2023) research findings in the field of maintenance and reliability engineering, stressing how technology adoption can lead to fewer breakdowns through predictive maintenance, real-time monitoring, and early issue detection.

Additionally, 88% of the respondents agreed that technology has led to increased efficiency in their work. This high level of agreement underscores that technology is perceived as a pivotal factor in enhancing the utilization efficiency within the transport services sector of the PSC. Technology is seen as a powerful tool for optimizing various aspects of fleet management, including vehicle utilization, route planning, resource allocation, and administrative processes.

The respondents' strong agreement suggests that they believe technology has significantly contributed to making fleet operations more efficient and effective.

The findings reinforce the idea that technology plays a pivotal role in enhancing efficiency. This aligns with Grabińska and Ziora (2019) research in the field of transportation management and logistics emphasizes how technology adoption can lead to increased efficiency through vehicle utilization optimization, route planning, resource allocation, and administrative processes.

When the respondents were asked if the technology had enhanced the efficiency, 95.6% affirmed it while the remainign4.4% did not think so. The data unequivocally indicates that the use of technology has significantly enhanced the efficiency of fleet operations within the Public Service Commission (PSC). This resounding consensus is particularly noteworthy, reflecting a collective belief among respondents that technology has brought substantial improvements to several critical facets of fleet management within the PSC. Notable among these improvements are the consistent mentions of time and cost savings, which numerous respondents attribute to technology integration. By streamlining various operational aspects, technology has effectively minimized the time required for tasks and reduced associated costs, making it a pivotal asset in the PSC's fleet management efforts. The overwhelming agreement among respondents that technology has led to time and cost savings resonates with existing literature. Studies such as those by Deng *et al.* (2015) and Wan *et al*. (2018) have demonstrated the cost-reduction potential of technology in fleet management through features like route optimization and efficient resource allocation.

Additionally, technology's impact extends to fuel management, with respondents acknowledging its contribution to efficient fuel consumption tracking, thanks to innovations like fuel cards. The acknowledgment of technology's contribution to efficient fuel consumption tracking corresponds with studies highlighting the role of telematics and fuel monitoring systems in optimizing fuel usage (Yang *et al.,* 2019). Fuel management is a critical aspect of fleet efficiency, and technology plays a pivotal role in achieving it. The survey responses also highlight the significance of technology in data management and record-keeping, as evidenced by mentions of clean and easily accessible databases. This streamlined approach to information retrieval greatly benefits the organization's overall efficiency. The emphasis on technology's significance in data management and record-keeping aligns with research on digital systems for maintaining accurate records and enabling data-driven decisions (Rao *et al.,* 2017). Clean and easily accessible databases are essential for efficient fleet management.

Lastly, it is evident that technology has lightened the workload for the transport management team, further corroborating its role in enhancing operational efficiency. This corresponds with studies on automation and the delegation of routine tasks to technology (Zhang & Li, 2018). This shift allows fleet managers to focus on more strategic aspects of their roles.

Conclusion

In conclusion, this study provides valuable insights into the impact of technology adoption on the Parliamentary Service Commission's transport services across several key objectives; in terms of maintenance efficiency, the findings demonstrate that fleet management technology has enabled improved vehicle servicing through reduced costs, simplified mileage tracking, and higher maintenance quality. The majority of respondents agreed that the technology has decreased maintenance time and improved quality. This confirms the significant role of technology in boosting maintenance productivity and minimizing disruptions. Additionally, regarding operational costs, the analysis found that the adoption of fleet technology has facilitated substantial cost reductions for the PSC's transport operations through enhanced fuel management, optimized fleet replacement cycles, and stronger overall cost control. Respondents overwhelmingly acknowledged technology's positive influence in driving efficient resource allocation and cutting unnecessary expenses. This highlights its value in bolstering the financial sustainability of the PSC's fleet operations. Additionally, the research revealed that technology has improved fleet utilization rates within the PSC by reducing breakdowns and downtime while increasing vehicle availability and staff satisfaction. The real-time tracking enabled by the technology allows for optimal fleet dispatcher, overcoming previous inefficiencies. Finally, in terms of user experiences, the study found general satisfaction with the technology's usability but also identified areas needing improvement, like mitigating system failures. Training and support to smooth technology adoption across user demographics also emerged as an area requiring ongoing attention, especially given the gender imbalance among users.

Recommendations

In light of the findings regarding the positive impact of technology adoption on the transport services within the Parliamentary Service Commission (PSC) of Kenya, several key recommendations emerge that merit serious consideration for the future enhancement of fleet management practices within the organization.

Firstly, the PSC must take proactive steps to increase the uptake of technology in fleet management. This can be achieved through a multifaceted approach, encompassing the procurement of modern fleet management systems, comprehensive training of staff members, and the development of supportive policies. The procurement of state-of-the-art technology systems will ensure that the PSC remains at the forefront of fleet management innovation. Concurrently, staff training will empower employees with the necessary skills to effectively utilize and maximize the benefits of these technologies. Supportive policies, on the other hand, can establish a conducive framework for the seamless integration of technology into daily operations.

Secondly, the PSC should prioritize continuous evaluation of the impact of technology usage within its fleet management practices. Regular assessments are essential to identify areas of success and gaps for improvement. Feedback from users, including both employees and service recipients, should serve as a primary driver for upgrades and changes to technology systems. This iterative approach ensures that technology remains aligned with the evolving needs and expectations of the organization and its stakeholders.

Lastly, collaboration with other agencies in the public sector to share best practices, benchmarks, and experiences regarding technology usage in fleet management is strongly recommended. Such collaborative efforts can foster knowledge sharing and collective learning, ultimately contributing to the overall improvement of public sector fleet management practices.

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