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INFORMATION, COMMUNICATION AND TECHNOLOGY SYSTEMS AND THE PERFORMANCE OF PASSENGER SERVICE IN KENYA RAILWAYS CORPORATION

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ABSTRACT

The Kenya Railways Corporation plays a crucial role in the country's transportation infrastructure, serving as a vital link for both passengers and freight. However, the passenger service in Kenya Railways Corporation (KRC) faces several challenges that hinder its optimal performance. The general objective is to establish the influence of information, communication, and technology systems on the performance of passenger service in Kenya Railways Corporation. Specifically, the study sought to determine the influence of the trains controls on the performance of passenger service in Kenya Railways Corporation, and to assess the influence of SGR passenger information on the performance of passenger service in Kenya Railways Corporation. This study was guided by: Theory of Constraints (TOC) and Service Quality GAP Model. The study adopted a case study research design; population for the study included 271 middle level managers working in different departments at Kenya Railway Corporation. Sampling for the study was probabilistic through use of Taro Yamane formula to arrive at a sample of 162 respondents across the strata. Data for the study was administered with questionnaires, which was dropped in-person, by the researcher, both validity and reliability was carried out before actual data collection. Data collected was analyzed through both descriptive analysis and inferential analysis. Descriptive analysis included: use of frequencies, percentages, and mean. Results of the study were presented using tables and figures. The study concludes that trains controls has a positive and significant effect on performance of passenger service in Kenya Railways Corporation. Further, the study concludes that passenger information has a positive and significant effect on performance of passenger service in Kenya Railways Corporation. The study recommends that the management of Kenya Railways Corporation in Kenya should implement a modern Automatic Train Control (ATC) system, which would significantly enhance the performance of passenger services. By integrating ATC, train operations can benefit from real-time monitoring, improved scheduling accuracy, and enhanced safety mechanisms such as automatic braking and speed regulation.

Key Words: Information, Communication, And Technology Systems, Trains Controls, SGR Passenger Information, Performance of Passenger Service

Background of the Study

The transport sector is a vital component of any economy, encompassing the systems and infrastructure responsible for the movement of people and goods across various modes, including road, rail, air, and maritime (Avramovic *et al*, 2023). It plays a critical role in enabling trade, supporting economic development, and facilitating access to essential services. A Railways Corporation is a state-owned or private entity responsible for the operation, management, and maintenance of a country's railway system (Lotz *et al*, 2020). It oversees the provision of rail transport services for both passengers and freight, ensuring the safety, efficiency, and reliability of rail operations. The corporation typically manages railway infrastructure such as tracks, stations, and signaling systems, and may also be involved in policymaking, planning future expansions, and coordinating with other transport sectors (Xie *et al*, 2020).

The Railways Corporation plays a crucial role in the economic and social development of a country by providing an efficient, reliable, and cost-effective means of transportation. It serves as a backbone for the movement of large volumes of goods and passengers across long distances, often at a lower cost compared to road or air transport (Mizuma, 2023). This supports trade, boosts productivity, and contributes to regional integration by linking urban centers with rural areas. Through its extensive network, the corporation facilitates daily commuting, long-distance travel, and industrial logistics, all of which are vital for national growth (Burroughs, 2023). In addition to, the Railways Corporation is also a significant player in environmental sustainability. Rail transport typically has a smaller carbon footprint compared to other modes of transport, especially with the use of electric or hybrid locomotives. By investing in modern, energy-efficient technologies and promoting rail as an alternative to road transport, the corporation contributes to reducing greenhouse gas emissions and combating climate change (O'Niell, 2020). Furthermore, the Railways Corporation often provides employment to thousands of people, supporting livelihoods and skill development across various regions. It also plays a strategic role in national security and emergency response by offering critical infrastructure that can be mobilized during crises such as natural disasters or conflicts (Dash, 2021).

Information, Communication, and Technology (ICT) systems refer to the integrated frameworks that enable the collection, processing, storage, transmission, and exchange of data and information. These systems combine hardware, software, networks, and people to facilitate the efficient flow of information within and between organizations or individuals (Qian, 2023). Information systems manage data through databases and applications to support decision-making and operations. Communication systems involve tools and platforms that enable the exchange of information across distances (Fraga-Lamas *et al*, 2023). Technology systems include the physical and digital infrastructure that support the functioning of both information and communication processes. Train control systems are responsible for the safe and efficient movement of trains by managing signaling, speed, and routing. These systems ensure that trains operate within set safety parameters and help prevent collisions and delays (Mishra, 2020).

Passenger information systems provide real-time updates about train schedules, delays, routes, and platform changes, helping passengers plan their journeys more efficiently. These systems use digital displays, mobile apps, and announcements to keep travelers informed (Lencwe, 2022). This study sought to establish the influence of information, communication, and technology systems on the performance of passenger service in Kenya Railways Corporation.

Statement of the Problem

The Kenya Railways Corporation plays a crucial role in the country's transportation infrastructure, serving as a vital link for both passengers and freight. As one of the oldest and most established transportation systems in Kenya, it contributes significantly to the nation's economic development by providing an efficient, cost-effective, and environmentally sustainable mode of transport (Gago, 2021). Railways facilitate the movement of people across regions, enhancing connectivity, promoting trade, and fostering regional integration. The corporation also contributes to the creation of jobs and supports various sectors, including tourism, agriculture, and industry, by enabling smooth and timely movement of goods. With the growing demand for urban mobility and the expansion of Kenya's economic landscape, the Kenya Railways Corporation's role in offering affordable and accessible transportation solutions remains indispensable (Oseko, 2022).

The passenger service in Kenya Railways Corporation (KRC) faces several challenges that hinder its optimal performance. These challenges are compounded by limited technological integration and inadequate infrastructure, which ultimately affect the overall passenger experience and operational efficiency (Chege, 2021). The quality of passenger service in Kenya Railways is significantly impacted by financial constraints and operational inefficiencies. Despite efforts to modernize the fleet, the corporation continues to report substantial financial losses. For instance, in the 2020/21 financial year, KRC posted a net loss of KSh 24 billion, primarily due to the underperformance of the Standard Gauge Railway (SGR) operations (Githaiga, 2021). This financial strain hampers the corporation's ability to maintain and upgrade its services, leading to issues such as delayed trains and inconsistent service delivery. Additionally, mechanical failures have been reported, affecting the reliability of services. For example, in December 2020, a newly launched Nanyuki train experienced mechanical issues with over 1,500 passengers on board, highlighting concerns about the maintenance and reliability of the fleet (Gago, 2021).

Customer satisfaction has been adversely affected by increased fares and perceived value. In January 2024, KRC raised fares by 50% across various services, including the Madaraka Express and commuter trains, citing rising fuel and electricity costs (Oseko, 2022). This fare hike led to an 11% decline in passenger numbers between January and March 2023, with the number of commuters dropping from 597,506 to 531,673. Such fare increases, without corresponding improvements in service quality, have contributed to diminished customer satisfaction. Despite these challenges, Kenya Railways has initiated efforts to enhance customer satisfaction. In May 2024, the corporation engaged with customers in Kisumu City to address service-related concerns, aiming to improve the Customer Satisfaction Index from 72% to 80% by 2027. These engagements are part of the broader strategic plan to enhance business performance through improved customer relations (Mizuma, 2023).

Operational costs remain a significant challenge for Kenya Railways. The corporation requires approximately 38.4 million liters of diesel annually to operate its trains, translating to an annual fuel cost of about KSh 6.22 billion. This fuel expenditure constitutes over 30% of the total operating costs, which have historically exceeded revenues, leading to substantial financial losses (Gago, 2021). In the 2020/21 period, KRC's operating costs were KSh 46.71 billion, while revenues were only KSh 25.03 billion, resulting in a loss of KSh 21.68 billion. The financial strain is further exacerbated by the corporation's debt obligations. Kenya Railways has defaulted on a KSh 167.5 billion loan borrowed from China for the SGR project, representing 62% of the total KSh 266.5 billion debt owed to the Treasury by state agencies.

This default triggers penalties estimated at KSh 1.6 billion, highlighting the financial challenges faced by the corporation (Oseko, 2022).

The integration of Information, Communication, and Technology (ICT) systems into Kenya Railways Corporation has had a transformative impact on the efficiency and quality of passenger services (Chege, 2021). Various studies have been conducted in different parts of the world on information, communication, and technology systems and performance of passenger service. However, none of these studies focused on trains controls system, passenger information system and commuter ticketing system on performance of passenger service in Kenya Railways Corporation. To fill the highlighted gaps, the current study sought to establish the influence of information, communication, and technology systems (trains controls passenger information system) on performance of passenger service in Kenya Railways Corporation.

Objectives of the Study

The general objective is to establish the influence of information, communication, and technology systems on the performance of passenger service in Kenya Railways Corporation. The specific objectives of the study are;

i. To determine the influence of train controls on the performance of passenger service in Kenya Railways Corporation.
ii. To assess the influence of passenger information on the performance of passenger service in Kenya Railways Corporation.

LITERATURE REVIEW

Theoretical Review

Theory of Constraints (TOC)

Dr. Eliyahu Moshe Goldratt postulated the theory of constraints (1984). The theory of constraints posits that achieving organizational goals is limited by a given number of factors referred to as constraints. The theory indicates that there exists at least one constraint in any company that inhibits the improvement of organizational performance (Mohammadi, 2021). The main focus of TOC in an organization is to identify these constraints and develop meaningful strategies to control or suppress the constraints. The theory further indicates that an organization's vulnerability is caused mainly due to a weak link in the organization. This weak link is likely to damage the organization's processes and operations, hence affecting its performance (Taiwo, 2022).

The theory of constraints indicates that either external or internal constraints limit organizational goals. An external constraint results in the organization providing more than the market can handle, and therefore, the organization must develop means to increase the demand for its services (Byougho, 2023). On the other hand, an internal constraint results in the organization delivering less than what the market demands. Different types of internal constraints in organizations include lack of skilled employees, organizational policies and regulations, and outdated equipment. As technological advancements are witnessed worldwide, ensuring that equipment is technologically improved to maximize production is necessary (Yunis *et al*, 2022).

The Theory of Constraints (TOC) has been criticized for its simplistic approach to complex systems, its narrow focus on bottlenecks, and its limited applicability in dynamic environments. The limitations arise due to the theory's assumption that constraints are static and easily identifiable, whereas real-world business processes often have multiple interdependent constraints that change over time (SimSit, Gunay & Vayvay, 2021). Further, TOC has been disputed for its lack of integration with modern analytical tools, such as advanced machine learning and data analytics which can provide deeper insights into operational inefficiencies (Mabin, & Balderstone, 2020). Furthermore, some scholars argue that TOC does not sufficiently consider human and organizational factors, for instance resistance to change and employee motivation which play an important role in process improvement.

The theory is applicable to the study in the sense that outdated railway lines (weak link in railway systems) are likely to affect the performance of railway corporations in terms of offering quality passenger services. Jincheng (2023) indicates that technological advancements promote effectiveness, safety and efficiency in railway corporations. By increasing efficiency of railway corporations, operational costs are reduced thus promoting increased organizational performance (Jincheng, 2023).

Service Quality GAP Model

The quality GAP model was pioneered by A. Parasuraman, Valarie Zeithaml and Leonard L. Berry (1985). The GAP model is used in organizations to get a clear understanding of customer satisfaction by highlighting major aspects of high-quality service. It explains the occurrence of divergences in the organization's process of service delivery (Aisyah *et al*, 2023). The model provides an organizational framework for service delivery in an organization and also identifies gaps in the framework to ensure the efficient and effective operation of the model. These frameworks are very crucial especially for organizations in the industry of service provision as the organizations are able to map inefficiencies within the organization that lead to poor service delivery (Zhen *et al*, 2023)

The quality service GAP model indicates that there are five gaps between service offered and expected service. These gaps include the gap between external communication and delivery of service, received services and expected services, expectations of customers and the perception of the organization's owners/management, specifications on service quality and delivery of services as well as the perception of the organization's owners and specifications on service quality (Wang *et al*, 2020). The service quality model, otherwise known as SERVQUAL, identifies five factors that influence the quality of services provided within an organization. These factors are easily identified from the acronym RATER which comprises of reliability, assurance, tangibles, empathy and responsiveness. An organization is therefore expected to fill these gaps and ensure that services offered follow the five aspects of SERVQUAL (Obsie *et al*, 2020).

The service quality theory employs SERVQUAL as a tool to measure customer satisfaction. The measure contains items that reflect RATER. Furthermore, the measure is based on the assumption that a customer evaluates the quality of services provided in an organization by comparing different views and perceptions on the organization's services and their previous expectations of the organization (Aisyah *et al*, 2023). The limitations of the theory include the excess emphasize on managerial control over service delivery without fully considering the role of external factors such as customer mood, cultural differences, and technological disruptions. Additionally, the model is more applicable to traditional service industries and may not fully address the dynamics of digital and self-service experiences (Alsaffar, 2020).

Kenya railways corporation can improve passenger service, and hence customer satisfaction, by ensuring that it follows the five aspects of SEVQUAL and filling the gaps identified. ICT in the railway system is used to increase the quality of services provided, and consequently the organizational performance (Muthimi, 2023).

Conceptual Framework

A conceptual framework is a structured representation of the key variables, concepts, and their relationships within a study. It provides a theoretical foundation that guides the research process by explaining how different elements interact (Croswell, 2019). Figure 2.1 shows the conceptual framework adopted by the research study. The independent variables are; trains control system, Passenger information system, while the dependent variable is performance of Railway Passenger Service.

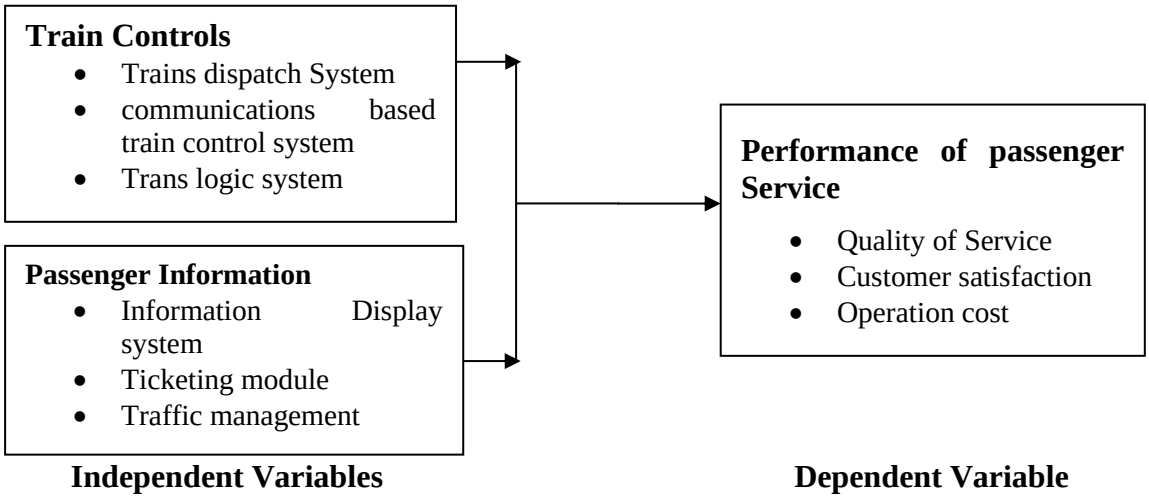

Figure 2. 1: Conceptual Framework

Train Controls

A Train Control System is a comprehensive set of technologies and procedures used to ensure the safe and efficient operation of railway networks. It manages the movement of trains by monitoring their location, speed, and direction, and by providing signals or automatic controls to prevent collisions and maintain safe distances between trains (Mohammadi, 2021). These systems can range from manual signaling and centralized traffic control to advanced automated systems like Positive Train Control (PTC) or the European Train Control System (ETCS). A key function of a train control system is to enhance safety, optimize traffic flow, and reduce delays by coordinating train schedules and responding to any irregularities or emergencies in real time (Taiwo, 2022). A Train Dispatch System is a critical component of railway operations that involves the planning, scheduling, and real-time management of train movements across a network. Dispatchers are responsible for issuing instructions to train drivers, coordinating train paths, and ensuring that services run on time while maintaining safety protocols. Modern dispatch systems use computer-based tools to visualize train positions, predict conflicts, and optimize routes (Byougho, 2023). They are essential for managing high-volume traffic, handling delays, and facilitating smooth transitions between different sections of the railway, particularly at junctions or congested areas. Efficient dispatching helps in minimizing disruptions and maximizing the capacity of rail networks (Yunis *et al*, 2022).

The Communications-Based Train Control (CBTC) system is an advanced signaling technology used in modern railway and metro systems to enable precise, real-time train location tracking and movement control. Unlike traditional fixed-block systems, CBTC uses continuous two-way digital communication between trains and trackside equipment, allowing for moving-block operations (SimSit, Gunay & Vayvay, 2021). This means trains can safely operate closer together, increasing capacity and reducing headways. CBTC systems enhance safety by automatically controlling train speed, enforcing safe distances, and preventing collisions (Mabin, & Balderstone, 2020). They also support automatic train operation (ATO) and can adapt more easily to changes in traffic demand, making them ideal for urban transit environments where reliability and frequency are crucial. The TransLogic System refers to an integrated suite of technologies and software used for managing and automating various aspects of railway operations (Jincheng, 2023). While the specific implementation may vary by provider, a TransLogic system typically includes modules for train scheduling, route planning, traffic management, maintenance tracking, and analytics. It helps railway operators optimize the use of resources, improve operational efficiency, and enhance decision-making through real-time data analysis. By integrating different components of the rail infrastructure into a unified platform, the TransLogic system enables coordinated responses to disruptions, better planning of train movements, and proactive maintenance, ultimately contributing to safer and more reliable rail service (Mohammadi, 2021).

Passenger Information

A Passenger Information System (PIS) is a technology solution designed to provide passengers with real-time information about their travel, enhancing the overall travel experience. It typically includes features such as displaying train or bus schedules, arrival and departure times, platform changes, delays, and route information on digital screens at stations, vehicles, or via mobile applications (Aisyah *et al*, 2023). The system uses various communication channels, such as public address systems, visual displays, and mobile apps, to keep passengers informed and updated about their journey. In addition to operational data, advanced PIS can also provide other valuable services such as weather updates, ticketing information, or alerts for disruptions (Zhen *et al*, 2023). By ensuring passengers are always informed, a PIS contributes to smoother travel, better customer satisfaction, and efficient management of transportation systems. An Information Display System (IDS) is a technological solution used to provide real-time, visual communication to passengers, drivers, or other users. It is commonly employed in transportation networks, such as railway stations, airports, bus terminals, and metro systems (Wang *et al*, 2020). These systems display essential information, such as train/bus schedules, platform assignments, delays, and directions, to help passengers navigate their journeys. In more advanced setups, IDS can also show weather updates, safety alerts, or promotional content. By using digital screens, LED boards, and other visual interfaces, an Information Display System ensures that travelers are kept up to date with timely and accurate data, enhancing the overall travel experience and reducing confusion (Obsie *et al*, 2020).

A Ticketing Module refers to the software and processes involved in the issuance, management, and validation of tickets for passengers. Typically integrated into a larger transportation management system, this module enables the sale of tickets through various channels, including self-service kiosks, online platforms, mobile apps, or ticket counters (Aisyah *et al*, 2023). It may handle multiple forms of payment, such as credit/debit cards, mobile wallets, and contactless cards, as well as provide options for different fare classes, discounts, and group bookings. Beyond ticket sales, a modern ticketing module often integrates features like real-time ticket validation, seat reservations, fare management, and data analytics to improve

customer service and operational efficiency (Alsaffar, 2020). Additionally, some systems support dynamic pricing or promotional offers to optimize revenue. Traffic Management is the practice of controlling and directing the flow of vehicles and pedestrians within a given area, such as urban streets, highways, or public transportation networks, to ensure safety, efficiency, and optimal use of infrastructure (Muthimi, 2023). This system typically includes strategies and technologies designed to minimize congestion, reduce accidents, and ensure smooth travel. In the context of public transportation, traffic management can involve coordination between different modes of transport, signal prioritization for buses or trams, monitoring traffic patterns, and responding to incidents in real time. Advanced traffic management systems may rely on sensors, cameras, GPS data, and artificial intelligence to predict traffic patterns, manage congestion, and adjust routes accordingly, leading to improved travel times and reduced environmental impact (Aisyah *et al*, 2023).

Empirical Review

Trains Operations and Performance of Passengers Service

Mohammadi (2021) researched on the role played and the influence of ICT on the performance of organizations. The study was descriptive, with a population of 235 employees working in various service companies. Through purposive sampling, a sample size of 50 employees was used, from which data was obtained through the use of in-depth interviews and structured questionnaires. The collected data was then evaluated by the use of regression and correlation analyses while SPSS was used in the analysis of the research hypotheses. The findings indicated that ICT advancements in both mobile and web applications have a positive influence on the performance of service companies. Specifically, the study found a positive correlation between quality services and the use of technologies such as artificial intelligence (AI), processing information using cloud and web services. The study further recommends the integration of more ICT systems in the operations of service companies to increase their efficiency and consequently improve the organization's performance.

Taiwo (2022) sought to assess the relationship between organizational performance and information, communication and technology. The study focused on how the performance of Covenant University was impacted by using information, communication and technology. The study based organizational performance on financial capability and ability to meet set goals and objectives. The study was descriptive with a target population of staff at Covenant University. Through purposive sampling, a sample of 20 respondents was obtained. Secondary data obtained from the university's records was used and analyzed using SPSS and Pearson's correlation coefficient. The findings indicated that there exists a relationship between the three study variables. Specifically, the study indicated that ICT has a positive influence on the overall performance of the organization and also promotes quality services in the accounting sector of the organizations. The study recommended that organizations should adopt ICT systems to promote accountability and service quality in their accounting system and enhance operational efficiency.

Byougho (2023) focused on the performance of ICT systems in government institutions and how these systems impact the operations of the institutions. The study focused on the influence ICT investment on operational performance of these government institutions. The study was descriptive and adopted both qualitative and quantitative approaches. Questionnaires were the main tool for data collection from a sample of 144 senior managers of Korean parastatals. Secondary data was obtained from ICT and published performance records of these parastatals. The sample size was obtained through multi-level random sampling. Analysis was done by the use of multiple regression models. The study indicated that based on its findings, ICT

convergence in government institutions promote organizational capacity as well as efficiency in administration of the organizations. The study further indicated that ICT promotes satisfaction of customers in government institutions.

Yunis *et al* (2022) focused on assessing the relationship between performance of organizations, innovation and ICT. The study was descriptive and specifically focused on how ICT-based innovations impacted organizational performance of SMEs in Lebanon. Questionnaires were used to obtain data from managers and employees of SMEs that had incorporated ICT in their operations. Descriptive statistics through SPSS and linear regression analysis were used in data analysis. The findings of the study indicated that organizations use both ICT and innovations as strategic tools to promote the quality of services provided. The findings further indicated that implicitness and entrepreneurial behavior is required to maintain the competitive advantage obtained from the ICT-based innovations. The study also indicated that ICT-based innovations have a positive influence on the performance of SMEs in Lebanon.

Passenger Information and Performance Passengers Service

Aisyah *et al* (2023) sought to assess the relationship between service quality and the aspects of Kortalia railway line (KRL) ticketing system. The study also focused on how the pricing mechanisms of the ticketing system impact customer interests and satisfactions. The study was descriptive and collected data by use of well-structured questionnaires from a sample of 125 passengers who use the commuter rail line. Descriptive statistics through SPSS and linear regression analysis were used in data analysis. The findings revealed that the prices of tickets in a railway line influences the interests of customers. In addition, the study indicated that implementing an effective ticketing system for rail services promotes customer satisfaction through provision of quality services.

Zhen *et al* (2023) conducted a study to assess the influence of service improvement priorities on passenger satisfaction. The study focused on the highspeed rail in Shanghai-Nanjing. A descriptive and correlational survey approach was used. Through stratified simple random sampling and the Yamane formula, the study was able to obtain a sample size of 125 passengers using the highspeed rail line. Qualitative and quantitative data was collected from the respondents by the use of self-administered semi-structured questionnaires. Descriptive statistics and content analysis were then used in analyzing the collected data. The study's findings indicated that passenger satisfaction is significantly influenced by factors such as staff attitudes and accessibility of the ticketing system. The study further indicates that an effective ticketing system should enhance accessibility of the trip and convenience in purchasing tickets.

Wang *et al* (2020) sought to assess the relationship between service quality and customer satisfaction in railway lines. The study specifically focused on urban rail transit in China. The study was explanatory and adopted a target population of 325 employees of Tianjin transit rail in China. The study administered structured questionnaires to the respondents. The Yamane formula was used to obtain the sample size, while the SPSS statistical software was used in data analysis. The findings indicated that facilities, equipment and online ticketing services of a railway line highly influence the quality of services provided. The study further indicates that online ticketing services has a positive influence on customer satisfaction. However, other factors such as trip safety and fare policies have a relatively significant influence on customer satisfaction.

Obsie *et al* (2020) researched on how service quality is enhanced in Addis Ababa's light train. The study focused on the perceptions and views of the passengers. The study was descriptive,

where a census study was conducted on the study's population that comprised of the management and other employees of the institution. Data was collected from the study's sample size through self-administered questionnaires. The deductive approach and MS Excel were used in data analysis. The findings of the study revealed that user satisfaction is enhanced through factors such as frequency, comfort, security, travel information and ticketing system. The study further indicates that these factors promote quality services and consequently user satisfaction.

RESEARCH METHODOLOGY

The study adopted a descriptive survey design. Durrheim (2016) defines case study research as a design that describes the natural occurrence of a situation when exhaustively focusing at a particular area of study. It might be used to explain and judge the current way of doing things and can also be used in theory development.

According to the KRC human resource department (2022), there are 271 middle-level managers in Kenya Railways Corporation HQs and SGR Nairobi terminus station who were used as the study's target population. The study focused on these employees as they are actively involved in establishing and using various ICT systems in KRC and are also aware of performance related issues as a result of the integrated ICTs systems. Table 3.1 below presents the study's target population.

A sample refers to a sub-section of the entire population that includes people, events, or items that can be used to make inferences for the study (Taherdoost, 2016).

The Taro Yamane formula gives a more accurate sample size with minimal errors, which was used to obtain meaningful results.

Table 1: Sample Distribution

Population Category	Total Size	Ratio	Sample size
Finance department	67	0.247	40
Procurement department	54	0.199	32
ICT department	73	0.269	44
Public relations department	43	0.159	26
Human resources relations and development department	34	0.125	20
Total	**271**	**1.000**	**162**

Questionnaires were the main tool for primary data collection in this study. The study adopted questionnaires due to their ease in administration and their accuracy in collecting data which is enhanced through confidentiality as it limits data manipulation (Brace, 2018). The questionnaires contained close-ended questions with the quantitative section of the instrument utilizing both a nominal and a Likert-type scale format. SPSS version 21 was used to code and compute primary data collected using questionnaires. The nature of the data to be collected in this study was both quantitative data. Data was therefore analysed through both descriptive and inferential methods of analysis (Kemp *et al*., 2018). Descriptive statistics carried out included: use of frequencies, percentages, mean and standard deviation. The analyzed data was then presented using frequency tables and bar graphs.

On the other hand, the inferential analysis data through the Multiple Linear Regression model was used to establish the significance of the influence of independent variables on the dependent variable (Andereck, 2017). The analyzed data was then presented using frequency tables and bar graphs

ANALYSIS AND PRESENTATION OF DATA

The researcher sampled 162 respondents who were each administered with the questionnaires. From the 162 questionnaires 142 were completely filled and returned hence a response rate of 87.7%. The response rate was considered as suitable for making inferences from the data collected. Smith (2018) indicates that a response rate that is above fifty per-cent is considered adequate for data analysis and reporting while a response rate that is above 70% is classified as excellent. Hence, the response rate of this study was within the acceptable limits for drawing conclusions and making recommendations.

Descriptive Statistics Analysis

Trains Controls and Performance of Passenger Service

The first specific objective of the study was to determine the influence of the trains controls on the performance of passenger service in Kenya Railways Corporation. The respondents were requested to indicate their level of agreement on statements relating to trains controls system and performance of passenger service in Kenya Railways Corporation. The results were as presented in Table 2.

From the results, the respondents agreed that delays in train dispatching are promptly communicated and well-managed (M=3.906, SD=0.837). In addition, the respondents agreed that the dispatch system effectively coordinates train schedules during peak hours (M=3.897, SD=0.901). Further, the respondents agreed that the CBTC system improves train safety through real-time monitoring and control (M=3.883, SD=0.843).

From the results, the respondents agreed that the train maintains accurate spacing and speed due to the CBTC system (M=3.865, SD=0.694). In addition, the respondents agreed that the Trans Logic system supports effective route planning and switching of trains (M=3.799, SD=0.762). Further, the respondents agreed that system responses to routing commands are accurate and timely (M=3.711, SD=0.818).

Table 2: Trains Controls and Performance of Passenger Service

	Mean	Std. Deviation
Delays in train dispatching are promptly communicated and well-managed.	3.906	0.837
The dispatch system effectively coordinates train schedules during peak hours.	3.897	0.901
The CBTC system improves train safety through real-time monitoring and control.	3.883	0.843
The train maintains accurate spacing and speed due to the CBTC system.	3.865	0.694
The Trans Logic system supports effective route planning and switching of trains.	3.799	0.762
System responses to routing commands are accurate and timely.	3.711	0.818
Aggregate	**3.844**	**0.809**

Passenger Information and Performance of Passenger Service

The second specific objective of the study was to assess the influence of SGR passenger information on the performance of passenger service in Kenya Railways Corporation. The respondents were requested to indicate their level of agreement on various statements relating to passenger information system and performance of passenger service in Kenya Railways Corporation. The results were as presented in Table 3.

From the results, the respondents agreed that the display screens are easy to read and visible from a distance in all weather conditions (M=3.881, SD=0.833). In addition, the respondents agreed that the information provided by the display system is regularly updated and reliable (M=3.830, SD=0.893). Further, the respondents agreed that the system provides various payment options, making it convenient for passengers to purchase tickets (M=3.821, SD=0.810).

From the results, the respondents agreed that the ticketing module offers accurate information regarding fare calculation and ticket availability (M=3.800, SD=0.773). In addition, the respondents agreed that the traffic management system effectively monitors and adjusts traffic flow to minimize congestion (M=3.731, SD=0.578). Further, the respondents agreed that the system provides timely updates on service disruptions or delays caused by traffic issues (M=3.713, SD=0.664).

Table 3: Passenger Information and Performance of Passenger Service

	Mean	Std. Deviation
The display screens are easy to read and visible from a distance in all weather conditions.	3.881	0.833
The information provided by the display system is regularly updated and reliable.	3.830	0.893
The system provides various payment options, making it convenient for passengers to purchase tickets.	3.821	0.810
The ticketing module offers accurate information regarding fare calculation and ticket availability.	3.800	0.773
The traffic management system effectively monitors and adjusts traffic flow to minimize congestion.	3.731	0.578
The system provides timely updates on service disruptions or delays caused by traffic issues.	3.713	0.664
Aggregate	**3.796**	**0.759**

Performance of Passenger Service

The respondents were requested to indicate their level of agreement on various statements relating to performance of passenger service in Kenya Railways Corporation. The results were as presented in Table 4.

From the results, the respondents agreed that the passenger service is reliable and operates on schedule consistently (M=3.756, SD=0.769). In addition, the respondents agreed that the facilities are clean and well-maintained (M=3.735, SD=0.581). Further, the respondents agreed that they are satisfied with the overall experience provided by the passenger service (M=3.701, SD=0.633).

From the results, the respondents agreed that the ticket purchasing process is convenient and user-friendly (M=3.686, SD=0.515). In addition, the respondents agreed that the fare prices are reasonable considering the quality of service provided (M=3.673, SD=0.734). Further, the respondents agreed that there are sufficient service options available within different budget levels (M=3.633, SD=0.738).

Table 4: Performance of Passenger Service

	Mean	Std. Deviation
The passenger service is reliable and operates on schedule consistently.	3.756	0.769
The facilities are clean and well-maintained.	3.735	0.581
I am satisfied with the overall experience provided by the passenger service.	3.701	0.633
The ticket purchasing process is convenient and user-friendly.	3.686	0.515
The fare prices are reasonable considering the quality of service provided.	3.673	0.734
There are sufficient service options available within different budget levels.	3.633	0.738
Aggregate	**3.697**	**0.666**

Inferential Statistics

Inferential statistics in the current study focused on correlation and regression analysis. Correlation analysis was used to determine the strength of the relationship while regression analysis was used to determine the relationship between dependent variable (performance of passenger service in Kenya Railways Corporation) and independent variables (trains controls system, passenger information system).

Correlation Analysis

The present study used Pearson correlation analysis to determine the strength of association between independent variables (trains controls, passenger information) and the dependent variable (performance of passenger service in Kenya Railways Corporation) dependent variable.

Table 5: Correlation Coefficients

		Performance	Trains Controls	Passenger Information
Performance of Passenger Service	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	142		
Trains Controls	Pearson Correlation	.870**	1	
	Sig. (2-tailed)	.000		
	N	142	142	
Passenger Information	Pearson Correlation	.829**	.218	1
	Sig. (2-tailed)	.003	.097	
	N	142	142	142

From the results, there was a very strong relationship between trains controls and performance of passenger service in Kenya Railways Corporation (r = 0.870, p value =0.000). The relationship was significant since the p value 0.000 was less than 0.05 (significant level). The findings are in line with the findings of Mohammadi (2021) who indicated that there is a very strong relationship between trains controls system and performance of passenger service.

Further, the results revealed that there is a very strong relationship between passenger information and performance of passenger service in Kenya Railways Corporation (r = 0.829, p value =0.003). The relationship was significant since the p value 0.003 was less than 0.05 (significant level). The findings are in line with the findings of Wang *et al* (2020) that there is

a very strong relationship between passenger information system and performance of passenger service.

Regression Analysis

Multivariate regression analysis was used to assess the relationship between independent variables (trains controls, passenger information) and the dependent variable (performance of passenger service in Kenya Railways Corporation)

Table 6: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.291	0.075		3.880	0.000
	trains controls	0.363	0.095	0.364	3.821	0.001
	passenger information	0.384	0.099	0.385	3.879	0.000

a Dependent Variable: performance of passenger service in Kenya Railways Corporation

The regression model was as follows:

$$\mathbf{Y = 0.291 + 0.363X_1 + 0.384X_2 +}$$

According to the results, trains controls has a significant effect on performance of passenger service in Kenya Railways Corporation β_1=0.363, p value= 0.001). The relationship was considered significant since the p value 0.001 was less than the significant level of 0.05. The findings are in line with the findings of Mohammadi (2021) who indicated that there is a very strong relationship between trains controls system and performance of passenger service.

Furthermore, the results revealed that passenger information has significant effect on performance of passenger service in Kenya Railways Corporation β1=0.384, p value= 0.000). The relationship was considered significant since the p value 0.000 was less than the significant level of 0.05. The findings are in line with the findings of Wang *et al* (2020) that there is a very strong relationship between passenger information system and performance of passenger service.

Conclusions

The study concludes that trains controls has a positive and significant effect on performance of passenger service in Kenya Railways Corporation. Findings revealed that Trains dispatch system, communications based train control system and trans logic system influence performance of passenger service in Kenya Railways Corporation

Further, the study concludes that passenger information has a positive and significant effect on performance of passenger service in Kenya Railways Corporation. Findings revealed that information display system, ticketing module and traffic management influence performance of passenger service in Kenya Railways Corporation

Recommendations

This study recommends that the management of Kenya Railways Corporation in Kenya should implement a modern Automatic Train Control (ATC) system, which would significantly enhance the performance of passenger services. By integrating ATC, train operations can

benefit from real-time monitoring, improved scheduling accuracy, and enhanced safety mechanisms such as automatic braking and speed regulation.

Further, the study recommends that the management of Kenya Railways Corporation in Kenya should deploy a real-time Passenger Information System (PIS) that provides timely and accurate updates on train schedules, delays, platform changes, and service disruptions across digital displays, mobile apps, and public address systems.

Suggestions for Further Studies

This study was limited to the influence of information, communication, and technology systems on the performance of passenger service in Kenya Railways Corporation hence the study findings cannot be generalized to performance of passenger service in other corporations in Kenya. The study therefore suggests further studies on the influence of information, communication, and technology systems on performance of passenger service at other corporations in Kenya.

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