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BUILDING CAPACITIES IN THE CIVIL SERVICE

Customer Satisfaction with Ethio-Djibouti Railway Transportation Services: An Analysis Using the KANO Model, by Tareke KM[1]

Abstract

This study aimed to assess the railway service quality and consumer satisfaction in Ethio-Djibouti railway (EDR), a new public transportation started in 2018. The study employed surveys, KANO model, and ordinal multiple regression to assess customer satisfaction. It is found that new EDR services are effective in five out of ten service quality categories or attributes, such as reliability, climate control, travel time, information provision, and cleanliness. The EDR line is experiencing improved satisfaction levels, operating better than bus and truck services, but with declining levels from 2021-2022. Recent customers and passengers have higher satisfaction levels than older and freight service users. Half of the analyzed attributes, mainly payment-convenience and staff/ hostel service, have insignificant impacts on customer satisfaction, while high levels of insignificance are found in payment-convenience and staff/hostel service. KANO model categorizes Staff/Hostess service and Cleanliness as BASIC features, while information provision is categorized as a performance feature. Reliability, Service-frequency & fare-levels are considered exciting features. However, customers are indifferent to payment-convenience, security, climate-control, and travel-time features. The study concludes that the chosen model, which emphasizes the significance of seeing a service as bundle of qualities rather than individual features, is correct. Since the KANO model helps to better understand customers' expectations and impact on satisfaction, these insights can inform EDR system and policy-makers to set market-driven priorities. To enhance customers' satisfaction, trust & values need to get adequate arrangements, technological-innovation and calibrate service performance monitoring instruments mainly on BASIC, exciting and performance features.

Key words: *Railway transport, Customer satisfaction, KANO model, Ethio-Djibouti railway and public transport policy*

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Introduction

Public transportation, particularly rail transportation, is a crucial aspect of modern society due to its socioeconomic and environmental benefits. It reduces travel times, expenses, traffic, fuel usage, and carbon emissions. As nations grow, rail transport networks become essential for meeting urban economic demands, making them a significant form of public transport (Lindfeldt, 2010; Rezapour and Ferraro, 2021; Yaghini et al., 2013).

Rail transport infrastructure is crucial for economic and social integration, facilitating the movement of people, products, and commerce. It is especially important for emerging nations like Ethiopia, where efficient public transport infrastructure, particularly rail networks for freight and passengers, is essential for the growth and prosperity of the nation's economy Tareke, 2022; Tareke and Baraki, 2024).

Ethiopia prioritizes customer satisfaction, focusing on high-quality service across industries. Major railway projects, like Addis Ababa City Light Railway transit and Ethio-Djibouti Railway, were developed to address transport issues and increase demand (National Planning Commission, 2016). Ethiopia and Djibouti inaugurated the first-ever railway service in Eastern Africa, with the Ethio-Djibouti Railway project aiming to become the premier transit provider by 2025. The project will provide smooth freight and passenger rail services between Ethiopian stations and Djibouti Ports (EDR, 2022). The rail transport sector's service delivery has not maintained its anticipated quality and level due to its dynamic nature and increasing consumer needs and expectations (MoT and ERC, 2019).

In recent years, the transportation industry has emphasized customer-oriented services and ensuring client satisfaction. Customer satisfaction is the client's assessment of how well their wants, expectations, or criteria were met after a service interaction (Grigoroudis and Siskos, 2010). Yeung et al. (2013) argue that customer satisfaction is more than just the product or service itself, and higher performance and loyalty are positively related to customer satisfaction, which is measured by the quality of the services received (Ramaswamy, 1996). Service attributes are tangible and non-tangible, encompassing non-material aspects like provider treatment and cost, and tangible aspects like infrastructure used. These attributes can be objectively or subjectively perceived by the client (Eboli and Mazulla, 2011).

According to Dabholkar, Shepherd & Thorpe (2000), and Dziekan (2008) Customer satisfaction is crucial for improving mobility in goods and passenger train services. Performance evaluation based on service users' and passengers' experiences can explain the operation and service quality of public transport systems, such as trains. Consumer contentment and service quality are directly correlated, and understanding and quantifying this relationship is essential for improving the quality of public transportation services. Assessments can be expressed as agreement or disagreement with key service criteria, liking or disliking, satisfying or unsatisfactory views and perspectives (Jen, Tu & Lu, 2011; De Oña & de Oña, 2014).

Customer satisfaction in the railway industry has been studied globally using numerous factors. Vincent (2014) and Feng, Jason, and Tang (2018) conducted studies on Kenyan trains using the SERVQUAL model and questionnaires. Their research focused on high-speed train service and the relationship between service enhancement priority and passenger satisfaction. Yohannes (2018) conducted studies on the Ethio-Djibouti railway in Ethiopia, focusing on opportunities for development and capacity expansion for around 50 years, while others focused on the no longer in operation services.

Previous research on Ethiopian rail service satisfaction and quality (Tareke, 2022; Habtamu, 2017; Adane, Mintesnot, and Berhanu, 2020), primarily focusing on Addis Ababa Light Rail Transit (LRT), uses a five-point Likert scale questionnaire and a limited number of variables, measuring satisfaction in small-sized samples since 2015. The other recent study on satisfaction towards Addis Ababa LRT is the one done by Woldeamanuel and Woldetensae (2020), which used 205 sample respondents and only considered fourteen service variables but found that passengers were satisfied with affordability and cleanliness but less satisfied with crowding, safety, and security of the service. The Ethio-Djibouti railway's vision, mission, and predicted benefits have been unclear since 2018, with little information available on their achievement and the effectiveness of the service from the perspective of service users. The new Ethio-Djibouti railway service in Ethiopia has received little investigation, particularly regarding consumer satisfaction. This study aims to identify gaps and improve service quality by examining how train service consumers perceive their experiences and satisfaction, thereby enhancing the overall customer experience.

Most customer satisfaction research uses expectations as a measure, neglecting the importance of service attributes and the ever-changing needs of customers. This simplistic approach overlooks the complex and ever-changing needs of customers, which are crucial for enhancing and sustaining satisfaction. The study aims to understand the satisfaction levels of service users with railway services using service attributes as a measure of satisfaction. It uses the EDR service as a case to explore opinions, views, and perspectives on service quality and performance qualities, addressing the existing knowledge gap. Customer satisfaction measurements and surveys primarily focus on service quality using SERVQUAL and SERVPERF models, neglecting other factors like service features, values, and perception. They also neglect the KANO model and focus on developed nations, where concepts of customer service differ from low-income nations (Khan & Fasih, 2014).

Vargo and Lusch (2004) developed a novel quality viewpoint by introducing the notion of quality in relation to customer satisfaction, service, and cost. Most of the previous studies also conducted with little focus on railway transportation industry but on others such as banking industry (Bedi, 2010; Khan & Fasih 2014; Kaura, et al., 2012), airline industry (Lubbe, Douglas, & Zambellis, 2011), hotel industry (Marković, & Raspor Janković, 2013), educational industry (Naidoo, 2014; Jayasundara, et al., 2009), and accounting firm (Aga & Safakli, 2007).

The study aims to address research gaps in the Ethio-Djibouti Railway Industry, a developing nation owned by Ethiopia and Djibouti, by examining customer satisfaction levels and the KANO model's effectiveness in measuring railway service satisfaction. The Kano model reveals that customers have diverse perspectives, influencing their happiness and behavior. It also reveals that consumers react differently to different characteristics. The model and data gathering techniques can help identify different consumer types, enabling segmentation analysis to understand how different groups perceive a given characteristic. This can help businesses tailor their offerings to cater to different consumer types (Kano et al., 1984; Kwong et al., 2011; Wang, 2013; He et al., 2017).

Accordingly, this research focuses on service user satisfaction, examining variations based on socio-economic and travel characteristics. It aims to measure drivers of satisfaction and dissatisfaction using calibrated models. The study aims to fill a literature gap, improve service quality, and provide policy considerations for future studies, while also contributing to the improvement of overall satisfaction.

More specifically, the study is motivated to carry out an empirical investigation to understand the impact of each EDR service quality attribute on the CSAT, identify the drivers satisfying and dissatisfying service users, and determine if satisfaction levels vary among different socio-economic and travel characteristics, using the Kano model by considering the complex and changing needs of customers as well as the values of service attributes. This paper is generally organized into sections such as introduction, methods and materials, findings, discussions, and conclusion sections.

Methods and Materials

Research Approach

The study utilized a mixed research strategy, combining multiple approaches to provide more conclusive empirical data. The sequential triangulation technique was particularly effective in obtaining complementary data on the issue of CSAT, combining quantitative and qualitative evidence, thereby enhancing the study's understanding.

The study involved key informant interviews (KIIs) on twenty indicators, followed by a KANO questionnaire survey on railway service users using refined ten indicators. The KII process helped identify key service quality attributes for detailed statistical analysis. Qualitative data on customer perception was collected for statistical regression and model analysis.

Data Types and Sources

The study utilized primary and secondary data sources, sourced from individuals who are users of modern technologies. Secondary data was sourced from reliable sources like published materials, research articles, blogs, NGOs, government documents, and reports. Although not as reliable as primary data, secondary data provided valuable information for literature review, research gaps, supporting data analysis, and recommendations.

Sampling Design

Target Population

The study focuses on Ethio-Djibouti railway (EDR) line customers, including passenger and freight service users. It includes those familiar with alternative modes like personal cars, buses, trucks, airplanes, and the old French railway service, but frequently using EDR service. The research enhances understanding of the market segment by benchmarking literature findings and comparing the satisfaction survey of the EDR line, including both in-vehicle and service components. As recommended by numerous studies and literature such as Research Advisors

(2006) and Krejcie & Morgan (1970), this research uses segmentation analysis and comparative assessment to explain customer satisfaction levels and variability. The number of sub-groups is crucial for determining sample size in quantitative studies like voters and surveys. The sample size for each sub-group must be large enough for reasonable estimation. The research treats each sub-group as a population and uses a stratified random sampling technique to select specific individuals.

The satisfaction survey targeted a heterogeneous population with different socio-economic and transport usage characteristics, including passengers and shippers. To determine the sample size for each category, at least two separate target populations were identified, such as passengers and freight service users.

Passengers' information and statistics were gathered from past studies and EDR head offices in Addis Ababa, Lebu, and Dire Dawa. However, the target population for shippers and freight service users was not known due to a lack of well-organized information about freight transport services. For example, in 2002, the Ethiopian Railways (ERR) served 501,000 passengers and 207,000 tonnes of freight. In 2022, an average of 850 passengers per day served the EDR service from Addis Ababa to Djibouti, resulting in 306,000 passengers per year. The author used these statistics as target population for passengers and unknown population for shippers to determine sample sizes.

Sample Size and Sampling Technique

The researcher used Krejcie & Morgan's (1970) and Anthony's (2014) formulas to determine the sample size for the known passenger population, while Cochran's (1977) formula was used for the unknown shippers or cargo service users' population. The study categorized the sample size into segments based on customer types, frequency of service use, stations, and socio-economic variables. The minimum sample size for EDR passengers and shippers or cargo owners was 376 and 210, respectively, resulting in 586 EDR customers or service users (Table 1).

Ethiopia's three EDR stations, Addis Ababa-Lebu, Adama, and Dire Dawa, were chosen due to financial and time constraints, as well as the significant volume of traffic flow and services they serve. Ethiopia has a total of 681 km rail line, covering 90% of the 752km route from Djibouti to Addis Ababa.

Table 1. Sample Size Distribution and Sampling Technique

S/N	Segment of Samples	N	EDR stations			n	Sampling
			Lebu/Endode (25%)	Adama (15%)	Dire Dawa (60%)		
1	EDR passengers (east & westbound trips)	306,000	69	40	267	376	Quota and accidental sampling
2	Shippers/freight service users (west-bound trips)	No clear statistics	38	16	156	210	Quota and accidental sampling
	Total	NA	107	56	423	586	NA

Source: Researcher's work (2022)

The EDR project and ticket offices reveal that three stations in Addis Ababa-Adama, Adama-Awash, and Awash-Djibouti have a higher traffic flow, passenger, and freight services. However, all stations have different capacity and service provision, with Dire Dawa station playing a greater role in both east-bound and west-bound train travels, resulting in a larger sample size quota.

Due to a lack of organized sampling frames for EDR transport service users, a probability sampling technique was used instead of probability sampling. Passengers and freight service users were selected based on socio-economic characteristics, including sex, age, and economic status. Additionally, sixteen key informants were chosen based on data saturation among EDR service customers for qualitative data collection in selected stations.

Methods of Data Collection

The study utilized primary and secondary data sources, employing mixed approaches like questionnaires, interviews, observation, and document review. It collected passenger and freight service user information from critical stations along the Ethio-Djibouti corridor, including Addis Ababa, Adama, and Dire Dawa. The research aimed to understand the needs and preferences of passengers.

In 2022, surveys were conducted on railway service customers, passengers, and shippers, to gather primary data on satisfaction levels. This data could be used for segmentation and comparative analysis to understand the variability among different customer categories, stations, and socio-economic backgrounds.

Close-ended questionnaires were self-administered to gather quantitative data for service quality and customer satisfaction evaluation surveys. The KANO-based questionnaire investigation involved data enumerators, railway operators, and staff members. The tool was divided into sections on socio-economic and travel characteristics, customer satisfaction attributes, service quality indicators, and challenging factors affecting railway service provision.

The survey used a 5 and 10-point Likert scale to rate customer satisfaction and service quality indicators and sub-indicators, following the KANO model procedures. A 10-point scale was chosen for refined sub-indicators due to increased accuracy. The scale with labeled midpoints was the best choice for the CSAT survey, and an even number scale increased the probability of positive or negative opinions.

The study aimed to reduce the error of central tendency in 5 and 7-point scales by keeping the survey short and concise. A 10-point Liker scale was designed, with sub-indicators refined to a maximum of ten, and used for a maximum of 10 minutes with concise questions. Longer surveys often resulted in higher dropout rates. The survey was designed with simple, concrete language and consistent syntax. It features a 10-point Net Promoter Score (NPS) scale with 2-3 labeled points for easy selection. The questionnaires are easy to understand and quick for analysis. A pilot study was conducted to ensure instrument validity and data quality.

The study used interviews and questionnaires to collect data and materials. Key informant interviews were conducted with selected EDR customers for 10 days to refine and identify key indicators. The refined indicators were used for a questionnaire survey within 20 days. An onboard survey was also used in consultation with the EDR company to reach all respondents while traveling. A large number of data collectors and training were employed to increase response rates.

Operationalization of Variables

The study focuses on service quality and customer satisfaction with EDR service, identifying key concepts, variables, indicators, and sub-indicators for quantitative analysis. The dependent variable is CSAT level, while the predictor variables are customer socio-economic, demographic, and service usage characteristics, and service quality attributes.

The study measures customer satisfaction using a 0–10-point scale, while the independent variables, service quality and features, are measured using a 5-point Likert scale. Respondents rate each indicator based on their likings and dislikes, using the principles of the KANO model. The KANO model was utilized to analyze service quality components and user needs, focusing on their impact on customer satisfaction and perception. The five key attributes identified as key to service quality and customer needs are Attractive, Performance, Must-have, Indifferent, and Reverse (Table 2).

Table 2. Operationalization of Customer Satisfaction (CS) and Service Quality Attributes

S/N	Attribute of service quality & customer requirements	Symbol	Measurement and i
1	BASIC, Must-have	M	As the presence of this is taken for granted, ins extreme non-satisfaction, but the sufficiency w
2	PERFORMANCE	P	The functional presence of the attribute genera in non-satisfaction
3	EXCITING, Attractive	A	The functional presence of the attribute resul absence would not affect CSAT
4	INDIFFERENT	I	Whether the attribute is present or not, would n
5	REVERSE	R	The presence of the attribute would generate increase CSAT

Source: Adapted from the KANO model (Kano et al., 1984 and He et al., 2017)

The EDR service quality and CSAT evaluation survey questionnaire identifies thirty sub-indicators from ten quality attributes, dividing them into 3 levels for functional and dysfunctional sub-features. Railway service ratings are processed using ten criteria, including security, payment procedures, on-board climate control, service frequency, travel time, reliability, cleanliness, information provision, staff/host service, safety, and seat comfort. The study used functional and dysfunctional customer questionnaires to gather service users' evaluations, requirements, and needs for quality attributes. The functional questionnaire revealed customer evaluations when the passenger/freight service met the sub-indicator, while the dysfunctional questionnaire indicated those when the service did not. The initial data from thirty sub-indicators was counted.

The study used a scale to value service quality attributes (1 to 10) based on criteria (i=1, 2,10) and a 5-point scale to rate their impact on customer satisfaction. The KANO model was found more suitable for classifying railway service attributes based on their relative impact on customer satisfaction as attribute performance changes. The Kano model formulation's generic response surface is beneficial for passenger transport service modeling due to its ability to model changes in satisfaction levels over time for the same attribute level, overcoming linearity assumptions (CQMJ, 1993; Lin et al., 2010; Chen, 2012).

Analysis Methods

The study used qualitative survey data, content analysis, quantitative surveys, and conjoint analyses to explore the relationship between EDR service quality attributes and customer satisfaction. Conjoint analyses and multivariate data analyses were used to model how customers combine individual attributes into overall service evaluation. A rating-based conjoint analysis was selected for this experiment, allowing for the design of hypothetical service packages based on service attributes offered on the EDR.

The study utilized a conjoint analysis framework to demonstrate the importance of both attribute levels and attributes in customer service evaluations, using an ordinal multiple regression model for separate relationship estimation. According to Tutz (2012) Ordinal multiple regressions estimate the cumulative probability of an outcome using a proportional odds assumption. The intercept value represents respondents' rating of the best possible service, with zero dummy values for other attribute levels. The coefficients indicate the directional effect of attribute level on customer satisfaction, with negative values indicating an inverse relationship. P-values less than 0.05 indicate statistical significance at a 95% significance level.

The multivariate ordinal regression model was used to estimate and predict the impact of various independent variables on the outcome variable, overall customer satisfaction. It does not assume levels are related and can estimate both linear and non-linear relationships. The model is suitable for categorical data structures relating to customer satisfaction, as dependent variables can be metric or non-metric measures. To regress CSAT with railway service, the following model was be used:

$$Y = \beta_{01} + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 \ldots + e$$

Where, Y is the dependent variable (DV) i.e. overall customers' satisfaction.

$X_1, X_2, X_{3\ldots}$ are the independent variables (IV) and

$\beta_1, \beta_2, \beta_{3\ldots}$ are the slope or regression coefficient of each IV?

The Ethio-Djibouti railway service's success relies on effective planning and forecasting of drivers affecting customer satisfaction and demand. One-way ANOVA tests were used to examine variations in satisfaction levels among customer segments, such as station locations. An independent sample t-test was conducted to test the hypothesis and identify significant differences between passengers and freight service users, domestic and international customers, and service usage years.

Data analyses softwares such as NVivo and SPSS & R were used for the qualitative and quantitative data analyses respectively. The study used descriptive statistical methods to analyze data, including frequency and percentage to summarize categorical variables like sex, station locations, railway usage characteristics, train or coach type, and passenger satisfaction levels. Descriptives were also used to find mean and median. The Kano model formulation's generic response surface is appealing for passenger transport service modelling.

Findings

As an answer to each research questions, the findings of the study particularly, quantitative, and qualitative data analysis and interpretations are presented in this section.

Demographic Data and Travel Behaviours of Respondents

Table 3. Respondents' Demographic and Travel Behaviors Data

Respondents' attributes	Responses	Frequency	Percentage
Which kind of customer you are?	Passengers service users	376	62
	Freight service users	210	38
What is the frequency of your railway service use?	Occasionally	41	7
	Once a week	75	13
	2 to 3 days per week	271	46
	4 days per week	199	34

Source: Field survey data (2022)

The satisfaction surveys were administered on the 586 EDR customers and service users to collect primary data using close-ended KANO questionnaires. The author made extensive efforts to avoid non-response rate of questionnaires. Accordingly, valid questionnaires were obtained to develop data set for the statistical and kano model analysis with no response rate. All key informant interviews (n=15) were also conducted successfully for the qualitative analysis.

Table 3 shows that, out of the valid 586 data collected through KANO questionnaire surveys, 210 (or 36%) data were obtained from EDR Freight service users while 376 (or 64%) from Passengers service users. Regarding the frequency of railway service use, about 271 (or 46%) and 199 (or 34%) of the respondents travel 2 to 3 days and 4 days per week, respectively. However, 75 (or 13%) and 41 (or 7%) of respondents travel once a week and occasionally, respectively. Therefore, the sample comprises respondents that can be considered customers or service users who are fairly familiar with the EDR service conditions in the corridor.

Qualitative Results

The major questions and issues that motivated this study were: what does customers' satisfaction mean in the railway service and how it is measured? How are service quality and customer satisfaction related? How good is the new EDR service? What are the divergences between reported satisfaction levels and customers perception and how can the EDR industry really satisfy customers? For this purpose, detailed interviews and discussions were first held with 15 rail service users on the specific service attributes. Participants were asked to provide

their opinions on the importance of several predetermined railway transport service attributes and were also asked to indicate how satisfied they were with the performance of the EDR in respect of the service attributes.

The survey moderators or data collectors were also urged to further probe participants on service satisfaction threshold values that would potentially be used to calibrate ranges in the quantitative survey. The detailed discussions with key informants and qualitative results about customer satisfaction revealed that respondents were more sensitive on the specific service attribute such as Reliability, Security, Safety, On-board climate control, Ticket Payment convenience, Fare levels, Speed of railway travel, Service frequency, Time to the nearest station, Crowding, Information quality, Cleanliness, Friendliness of train service staff, and On-board entertainment.

Quantitative and KANO Model Findings

The qualitative survey results informed the design of the quantitative survey instruments. Based on this the KANO model parameters, a 5-point questionnaire and a rating-based conjoint analysis framework were applied for the collection of primary quantitative data and estimate of the relationship between service quality and customer satisfaction using a regression model.

Because the view that customers rate service as a package of attributes and not just individual attributes and customer satisfaction is the overall outcome of the effect of attribute levels. The service quality parameters were used as predictor variables and customer satisfaction as the outcome variable in the model. Accordingly, the effects of service quality parameters were estimated using the ordinal multiple regression model (Table 4).

Based on the results of qualitative interview data, the basic and most sensitive service quality attributes were identified and used as input or explanatory variables for the quantitative analysis using ordinal multiple regression model. As indicated in Table 4, the extent of customer satisfaction (CS) with the CS+ coefficients (i.e. satisfaction coefficients which is between 0 to 1) and CS– coefficients (i.e. dissatisfaction coefficients which is always a minus number) of the three levels of each attribute were measured.

For the CS+ coefficients – the closer the result is to one, the higher the effect on customer satisfaction. Conversely, a CS+ coefficient near 0 suggests that that feature has very little influence on satisfaction. It was also needed to consider the dissatisfaction coefficient (CS–), simultaneously. If this lies towards -1, then not including this feature has a strong impact on customer dissatisfaction. A value close to 0, conversely, means that the absence of this feature is not likely to make customers dissatisfied. The CS– coefficient is always a minus number, which underlines the negative influence on satisfaction if the feature in question is absent.

The satisfaction and dissatisfaction coefficients were a good guide when ranking and classifying individual features. According to the statistical analysis of the regression model, out of ten attributes the ones that are found to have some levels estimated to have relatively significant impact on the outcome variable, i.e. customer satisfaction, are: Reliability, Climate control, Travel-time, Information provision and Cleanliness.

Interview data showed that unlike the passenger's freight service users were also positive for additional service quality categories or attributes such as trains' carriages, maintenance of trains and stations, frequency of trains and accessibility generally to stations/platforms.

On the other hand, insignificant impact is found for the rest five quality attributes such as Payment convenience, service frequency, fare levels, security and Staff/Hostess service. High levels of insignificance are detected, particularly in respect of payment convenience and Staff/Hostess service. A relatively high intercept implies that their satisfaction may be explained by parameters other than the ones included in the model. This is expected, since the attributes chosen for modeling purpose were out of the many other attributes that were expressed by participants of interview discussions. Estimating the parameters with a zero intercept, while it would improve the model fit, would compromise the reliability of the model.

Table 4. The Regression Model to Estimate the Service User Satisfaction

Attribute	Attribute levels	Coefficient	P-value
Payment convenience	In cash only, inside train and at station any day of month	-0.461	0.234
	In cash only but at payment station any day of month	-0.267	0.071
Frequency	One train per day per direction	-0.052	0.161
	One train per two days per direction	0.203	0.584
Cleanliness	Slightly clean vehicle/train/stations	-0.188	0.553
	No clean vehicle/train/stations	-0.499	0.323
Fare level	Equal to up to 50% the tariff of other options in the same O-D	-0.325	0.001
	Equal to the tariff of other options in the same O-D	0.014	0.083
Reliability	Sometimes reaches & leaves up to 30 minutes late	-0.865	0.0002
	Sometimes reaches & leaves over 30 minutes late	-1.146	0.0001
Staff/Hostess service	No hostess but with self-service on refreshments	-0.158	0.122
	No hostess and no refreshments	-0.426	0.005
Security	1-10 crimes reported per month	0.074	0.512
	Over 10 crimes reported per month	-0.265	0.056
Climate control	Slightly uncomfortable temp	-0.525	0.0350
	Extremely uncomfortable temp	-0.372	0.0004
Travel-time	Equal to over 50% the travel-time of options in the same O-D	-0.746	0.1062
	Equal to up to 50% the travel-time of options in the same O-D	-0.382	0.0001
Information	Poorly communicated service timetables & changes	-0.624	0.0001
	Service timetables & changes not communicated	-0.958	0.0001
Intercept		6.425	NA
Sig.		0.010	NA
R²		0.48	NA

Source: Field survey (2022)

Discussion

Even though two regression models were separately run for passenger and freight service customers, a combined regression model was run because the current research evaluated customers' satisfaction as a function of a combination of attributes and input data from all kinds of customers. Since, accuracy of KANO model is sensitive to the number of service quality attributes, attribute levels and sample size; the application of a combined regression model was also due to the use of larger respondent samples and greater number of attribute as well as their levels that may increase the complexity and impracticability of the survey if separate models are used.

The model was found to be significant at Sig.=0.010. About 48% of the variance and effects on the outcome variable i.e. customer satisfaction was also explained by the model, which is a reasonable value (r^2=0.48). The combined regression model statistical analysis reveals that out of the selected ten service quality attributes there are a number of attributes that have some levels estimated to have relatively significant impact on the outcome variable i.e. customer satisfaction such as Reliability, Climate control, Travel-time, Information provision and Cleanliness. Accordingly, EDR is doing satisfactory services on these attributes which have significant impact on CSAT. This is similar with findings of studies such as Woldeamanuel and Woldetensae (2020), which confirmed that passengers were more content with the service's cost and cleanliness than with its crowding, safety, and security.

However, almost half of the statistically analyzed attributes have some levels estimated to have insignificant impact on the outcome variable. These are: Payment convenience, service frequency, fare levels, security, and Staff/Hostess service. Particularly in respect of payment convenience and Staff/Host service high levels of insignificance are detected which have also stronger impact on the dissatisfaction, emotion and trust of the customers. These findings are consistent with previous studies such as Ismail et al., (2006) and FengZhen, Jason and Jia Tang (2018) that revealed the price of services directly influences not only service quality but also customer satisfaction.

In the case of the current customers' satisfaction survey, the statistical findings of KANO model attribute classification are found to be consistent with the qualitative results. This is because, except for the six attributes whose levels are defined incrementally better, the negative ratio sign in four attributes including Payment convenience, security, climate control and travel time are indicative of a counterintuitive relationship between their performance and customer satisfaction. This means customers are found to be indifferent to features such as Payment convenience, security, climate control and travel-time no matter how much they are implemented. When achieved or not achieved and when present or not resent the customer's satisfaction or behavior does not change. EDR company need to be aware of that improving these quality feature does not increase satisfaction.

Empathy, according to Aga & Safakli (2007) and Naidoo (2014), has a major impact on customer satisfaction since it attends to each individual client's demands. Jayasundara et al. (2009), also indicated that empathy, reliability, and assurance all have a substantial impact on customer satisfaction. Customer satisfaction has been achieved by an improvement in the quality of a certain service of public transport, particularly the reliability, which could encourage more people to utilise it (Lindfeldt, 2010; Rezapour and Ferraro, 2021).

In line with the findings of these studies, in the current study the service quality features such as Reliability, Service frequency and fare levels are found to be exciting, or delighter or attractive features because they are unexpected, totally surprising and capable of delighting customers by offering more than they expect. This means, even though customers get overly excited when these attractive features are well-implemented, customers are usually indifferent when the features are not present. This is because, customers may not even be aware of the possibility of their existence, and these are features that customers did not know they might need them. However, once Reliability, Service frequency and fare levels are presented or well-implemented in the EDR service customers will be delighted to have them. Thus, satisfying these attractive or exciting quality features or needs of customers allows the EDR company to excel, and be world-class in its services.

Since there is direct correlation between the level of implementation of "Information provision" and customer satisfaction, out of the ten features information provision alone is categorized as a performance feature. This means, satisfying the needs of customers particularly on information provision allows the EDR Company to remain in the transport market in the corridor. Since, other transport service providers usually end up competing on such feature with each other, EDR company may provide the maximum implementation of information provision at an attractive price.

Based on the KANO model analysis, Staff/Hostess service and Cleanliness are categorized as Basic feature of EDR service, which is also known as Must-Have or Must-be, or mandatory features. This is because, both service quality features are those that customers usually expect to see, and these features must work. As their presence in the EDR service delivery is taken for granted, satisfying customers with these features or needs allows EDR Company to get into or get easy entry to the transport market.

More specifically, whenever the Staff/Host service or respect and Cleanliness are present and fully implemented in the rail service, customers will be indifferent about it. It is simply assumed that the service will function with that feature. On the other hand, whenever these quality attributes are not present and not implemented, the EDR service is viewed as broken by customers. Similarly, Ismail et al. (2006) and Aga & Safakli (2007), showed that customer satisfaction is significantly impacted by service quality.

It does not matter what other features the EDR service has. That is why, as Staff/Host service or respect is not achieved in EDR service customers' satisfaction dropped significantly and then the service is not considered as good enough. Correspondingly, past studies (Cook et al., 2002; Friman, Edvardsson, and Gärling, 2001), showed that the experience appears to be the primary factor influencing the evaluation of service encounters, rather than the duration. Satisfaction is more impacted by intangible service attributes than by tangible ones.

It can be understood from the foregoing analysis that service attributes and their impact on customer satisfaction can only be classified, once properly measured, for the market in which they were measured. It is mandatory for the EDR company to assess and know the market being served to facilitate the design of rail service provisions that are market responsive. Failure to do so may lead to the maximization of service gaps (promotional, understanding and procedural gaps) identified by Hill and Alexander (2006) and TajuAbdulaziz (2020), resulting in a structurally misaligned service between intended customers and the service offering.

Conclusion

The research aims to investigate the casual link between railway service quality and consumer satisfaction in the Ethio-Djibouti railway, a public transport service designed for sustainability and managing travel demand, to inform planning and management. The study aims to modify railway transport operations and services to meet consumer demands, increase customer satisfaction or reduce dissatisfaction. Although defining service quality standards is common in public transport management, the connection between these standards and satisfaction can be ambiguous. The study uses qualitative and quantitative concepts of customer satisfaction and related analytical models for empirical analysis. The study focused on a significant market group of commuters or passengers who choose to use the Ethiopia-Djibouti railway, comparing their knowledge to literature findings. Results were gathered through surveys, KANO model, conjoint analysis, and multivariate data analysis, primarily using ordinal multiple regression. It was proven that the chosen model in service research, which emphasises the significance of seeing a service as a bundle of qualities rather than individual features, is correct. In the specific instance of the Ethio-Djibouti railway transportation, the entire voyage constitutes a service, not only the portion that takes place within the carriage. It was also clear that there are a variety of needs, demands, and expectations for an Ethiopia-Djibouti railway service, often articulated incoherently, even within this specific railway market.

Aspects of the qualitative investigation were supported by the quantitative portion of the study. It was demonstrated using a KANO and conjoint analysis modelling framework that not only attributes but also attribute levels are crucially essential in customer service evaluations owing to non-linear influence on customer satisfaction. In instance, results from consumer satisfaction surveys verified the impact of the Kano model. It was demonstrated that once a service design has been chosen, both current and potential consumers can evaluate its performance consistently.

The interview results revealed that the new EDR line is doing well compared to other public transport options such as bus, truck and airplane services currently provided in the corresponding corridor as well as the previous railway services operated before 2018.

According to the KANO model analysis, the new EDR services are found to be commonly good for both categories of customers' satisfaction levels in five out of ten service quality categories or attributes such as Reliability, Climate control, Travel-time, Information provision and Cleanliness due to their significant impact on satisfaction. Trains carriages, and good maintenance of trains as well as stations were also additional reasons for satisfaction particularly for freight service users.

Key informants show that overall satisfaction levels are improving at a corridor level, from 80% to 83% pre- and post-2018, but gradually declining from 2018 to 2022. New customers have higher satisfaction levels than long-term users, mainly due to poor service quality in the first two years since 2018. Among the typical EDR customers, passengers have more satisfaction and a tendency to be more tolerant of less-than-ideal service delivery than the cargo service users. Almost half of the statistically analyzed attributes have relatively insignificant impact on the outcome variable such as Payment convenience, service frequency, fare levels, security and Staff/Hostess service. Particularly in respect of payment convenience and Staff/Hostess service high levels of insignificance are detected which have also stronger impact on the dissatisfaction, emotion and trust of the customers.

The study found that service quality indicators confirm EDR service's satisfactory performance, although they may not accurately reflect customer emotional connections like trust and value. Despite the exaggerated portrayal of the EDR railway industry in reports and media, the study found a significant correlation between customer satisfaction and retention, suggesting that both retaining and attracting customers are crucial for service quality. It is possible to conclude that Kano model really helps railway service providers to better understand their customers' expectations, and the impact of these on customer satisfaction. The findings and insights of the study imply and help to set market-driven priorities in the Ethio-Djibouti railway service development strategy and to avoid spending time on unnecessary development. This of course saves time and money and saves resources. Ethio-Djibouti railway system need to use the Kano model to enable the system to concentrate on the things which have the highest effect on customer and user satisfaction, which will secure the success of Ethio-Djibouti railway system long-term.

Based on the findings, practical recommendations for policy and decision-making considerations relating to the incorporation of customer satisfaction, and the manner of doing so, in the Ethio-Djibouti railway system were suggested as follows:

- The need to create, for service evaluation reference purposes, an agreed to service definition formulated by a tripartite arrangement comprising prospective operators, contracting authorities and prospective customers.
- Calibrating service performance monitoring instruments based on empirical relationship between customer satisfaction and retention or attraction probabilities.
- The Kano model can help understand customer expectations and satisfaction implications, enabling market-driven priorities in the Ethio-Djibouti railway service development strategy. This allows the system to focus on areas with the highest impact on customer and user satisfaction, ensuring long-term system success.
- To retain customers and attract potential ones, it is crucial to focus on staff/hostess service, cleanliness, and information provision. Enhance reliability, service frequency, and fare levels of EDR service to provide unexpected delights. To enhance customer satisfaction, trust, and values, provide adequate arrangements, technological innovation, and calibrate service performance monitoring instruments focusing on basic, exciting, and performance features.

The KANO model's attribute classification accuracy is influenced by the number of attribute levels. To improve accuracy, larger respondent samples or more attribute levels are needed. Future research could use separate regression models based on customer or target groups instead of a single model.

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