Service quality of e-hailing taxi services in Johannesburg

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Abstract: The study examines the service quality dimensions of e-hailing taxi services for passenger flow in Johannesburg. The objective is to determine the major service quality characteristics that affect customer satisfaction for using e-hailing taxis in Johannesburg. Questionnaires were randomly distributed to 499 e-hailing taxi users in Johannesburg. This study identified and tested service quality dimensions relevant to passengers' desire for a transport service. The study added safety and affordability to the traditional five service quality factors for analysis. The data collected were subjected to exploratory factor analysis (EFA) and regression. EFA identified reliability, tangibility, safety, and empathy as the major service quality factors for e-hailing taxis in Johannesburg. It was found that these variables significantly affect customer satisfaction with e-hailing taxi services in Johannesburg. A change in reliability will contribute about 19% to customers' perception of e-hailing taxi services, 28% for tangibility, 15% for safety and 19% for empathy, respectively. The study indicates the importance of safety as a major service quality dimension of public transportation. It implies that e-hailing taxi operators need to pay attention to passengers' safety with vigilance and appropriate safety measures.

1　Introduction

Technological advancement has led to a global shift whereby a large range of products, services, and information can be accessed using smart devices. There has also been continuous growth in application-related services, from Google Maps and music to transport-related apps known as electronic-hailing (e-hailing), such as Uber, Bolt, and in-Driver [1,2]. Global Positioning systems (GPS) and advances in software applications have resulted in a growth of e-hailing transportation services, where passengers and drivers are connected using the internet [3]. The need for real-time interaction between the driver and the customer has given traction to e-hailing transportation [4]. Within Johannesburg, e-hailing services have gained a huge market due to their ability to offer people an alternative form of public passenger transport flow. E-hailing taxi services can match the public passenger flow and transportation supply [5]. Despite the popularity of e-hailing taxi services in emerging cities, especially in sub-Saharan Africa, there is limited knowledge regarding the most important service attributes to users, as well as their level of satisfaction.

The growing use of e-hailing services has led to a need to analyse consumers' opinions and satisfaction or discontent after the service is provided [6]. Understanding user satisfaction is crucial and will determine whether a service will be used again [7]. Currently, customer satisfaction is determined by rating their experience towards a driver, using a scale of 1 to 5 stars on the e-hailing apps to rate the overall service experience of users for a more in-depth understanding of what service attributes users value most [8]. Several studies on the service qualities of different economic sectors globally indicate that it has received much research attention from scholars over the years [9]. Most of the studies applied the service quality indicators popularly named SERVQUAL by [10] to analyse the dimensions of service provision and customer satisfaction.

This study extends the knowledge about service quality by using a modified SERVQUAL model to measure the perceived service quality of e-hailing taxi services. While the traditional SERVQUAL model has five dimensions, the current study added safety and affordability, which are context-relevant attributes to measure customer satisfaction. Safety includes security, which is relevant given the many reported safety and security problems in public transport services in Johannesburg. The affordability dimension is important given that many of SSA's cities, especially Johannesburg, have high-income inequalities [11]. [12] stated that the increasing growth in

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motorisation results from the decreasing urban transport safety. It indicates that e-hailing taxi services will have to address the safety perception to achieve customer satisfaction. Also, the ability of the public to pay for e-hailing taxi service, which is more expensive than traditional minibus taxis, is another concern about e-hailing taxi service quality and customer satisfaction. [13] noted that many households in automobile-dependent countries such as South Africa spend more than what is affordable on transportation. Also, [14], a World Bank paper reported that the poor in cities of developing countries find it difficult to afford public transportation. So, this paper examines the service quality of e-hailing taxis and customer satisfaction in Johannesburg. The study informs e-hailing taxi service providers and drivers about the important service quality dimensions to users, thus enabling them to better meet their customers' service needs. The relevant government agencies are also informed on possible policy directions that can support the industry to meet user requirements. The study contributes to the existing knowledge by answering the following questions.
1. What are the most important service quality dimensions for e-hailing taxi service customers?
2. How do the most important service quality factors affect customer satisfaction in Johannesburg?

The paper is structured under six (6) sections. After this section, section 2 presents the literature review, while section 3 describes the methodology adopted for the conduct of the study. Section 4 provides the study results, section 5 discusses the results, and Section 6 concludes the paper.

2 Literature review
2.1 *Service quality and its dimensions*

Service quality has been described as a comprehensive means of evaluating a particular service in terms of customer expectations and satisfaction levels [15]. The description of service quality assumes that service quality determination is by the judgement of customers, comparing expectations with perceptions of actual service received [16]. From the consumer perspective, service quality is the difference between expected and perceived service [17]. Service quality remains an evolving concept that requires contemporary management skills to position a business favourably in the market [18]. The significant contribution of service quality to business growth is customer satisfaction and loyalty. Because of the importance of service quality to business growth, many studies measure service quality by perceived customer satisfaction, loyalty, and retention [17-20].

One of the many service quality measures is the SERVQUAL model, which measures the perceptions and expectations of five dimensions: reliability, empathy, responsiveness, assurance, and tangibility [21]. Several studies have assessed the service quality of different industries using the five dimensions. Service quality studies cover industries such as beverage industries [21], the health sector [22], libraries [23], the banking industry

[17,20], auto mechanics [19] etc. However, [16] included satisfaction, trust, and commitment as additional dimensions to measure service quality from a marketing perspective. Also, [20] found access, finance, and employee competence as significant additions to service quality dimensions in the banking industry. It implies that contemporary studies in service quality may further examine the industry and context-specific attributes to measure service quality. Following [16], this study adapts the five dimensions of service quality attributes with the addition of safety, customer satisfaction, and affordability to explore the e-hailing taxi service in Johannesburg.

2.2 *Transport service quality*

Public transportation in Johannesburg, South Africa, is traditionally dominated by minibus taxis, buses including PUTCO, Metrobus, BRT-Rea Vaya, and trains, namely Metrorail and Gautrain [24]. The e-hailing service has become a major transport service provider serving as an alternative mobility means for public transport as well as private car users. Studies on transport service quality in Johannesburg have been published. For example, [24-26] compared the service qualities of bus and mini-bus operations. [27] measured the perception of commuters about the service quality of mini-bus operators. [28] examined the service quality of mini-bus taxi commuters, specifically referring to the violence that black females are exposed to while commuting in Johannesburg.

2.3 *Research gap*

Numerous studies have been conducted on the service quality of e-hailing transport services. For instance, [6] focused on augmenting the SERVQUAL model by adding the price dimension and focusing on those service quality aspects most valued by e-hailing users in Malaysia and Indonesia. Utilising the SERVQUAL model, [3] assessed the service quality of Uber drivers in Ipoh, Malaysia, to explore users' perception of e-hailing services. A study by [29] focused on service quality using the RECSA model to determine Malaysian users' intention to use e-hailing services. Within South Africa, studies about e-hailing services have centred around young people's travel behaviour and attitudes toward different modes of transport, the influence of e-hailing on urban mobility in South Africa, as well as the institutional void associated with e-hailing platforms in Colombia and South Africa [30-32].

However, there is still a scarcity of studies on transport e-hailing taxi services in Johannesburg. The few available studies related to e-hailing taxi services investigated crime [33] and employment [34]. In addition, [35] investigated the operational and labour policy framework for e-hailing services in South Africa. The existing scope of research on transport service quality in South Africa indicates the existence of a knowledge gap about the quality of e-hailing taxi services, which this study fills by investigating user satisfaction with the service quality dimensions. Hence, this study focuses on service quality by modifying the

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SERVQUAL model, including safety and affordability, to investigate e-hailing taxi services in Johannesburg. This study thus contributes to the existing literature by examining the experience of commuters using e-hailing taxi services in Johannesburg, South Africa.

2.4 Theoretical review

The study reviewed two theories about service quality measurement. The first, as proposed by [10], known as the SERVQUAL model, measures the perceived service against the expected service to determine customers' satisfaction with a particular service using ten (10) dimensions. [36] retained the theory and model but reduced the service quality dimensions to five (5) and listed them as reliability, responsiveness, assurance, tangibility, and empathy. Other revisions of the model retained the construction and the five service dimensions. The second theory reviewed for this study was proposed by Cronin and Taylor [37,38]. The theory was built on the SERVQUAL model but considered performance as the only factor measuring service quality [39]. Hence, the model was named SERVPERF to investigate the perceptions of service quality as a proxy for customer satisfaction. The model measured performance using the five dimensions of SERVQUAL in place of service expectation and perception. So, this study applied the ideas of the SERVQUAL model by examining the service quality of e-hailing taxis in Johannesburg.

3 Data and method

The study is explanatory research and adopted an exploratory research design to achieve its objectives. The goal was to investigate the service quality of e-hailing taxi services to add to the existing knowledge of traditional forms of transport since research on e-hailing taxi services as a means of mobility is limited in Johannesburg. The study considered the population of Johannesburg at 5.635 million and determined the sample size using 1 over 10,000 persons living in the city. Therefore, the sample size for the study is 564. So, 564 copies of a well-designed questionnaire were produced for data collection. The data for the study were collected by sampling a total of 499 respondents in Johannesburg. The response rate is 88.5 per cent. The questionnaire was administered to the respondents randomly at various shopping centres in Johannesburg East, Central, North, South and West Rand. The respondents frequently use e-hailing taxi services to and from shopping centres. The survey was conducted using a simple random sampling technique to ensure that members of the population had an equal chance at the survey. The random technique was applied using Microsoft Excel by generating random numbers of the 564 samples. Then, the generated random numbers were assigned to each copy of the questionnaire before administration for data collection. The study surveyed adults who could independently choose their mode of public transportation in Johannesburg.

The questionnaire was presented in two sections. A section was devoted to demographic information, while the second section focused on obtaining perceptions of service quality attributes. The service quality dimensions adopted in the study are reliability, safety, affordability, responsiveness, assurance, empathy, and tangibility. Customer satisfaction was included as a variable in the questionnaire to measure the respondent's perception of their satisfaction with e-hailing taxi services in Johannesburg. Each of the dimensions has five (5) items of measurement. The study thus comprised forty (40) scale items to measure the quality of e-hailing taxi services in Johannesburg. The items were presented on a 5-point Likert scale, from 1 – Strongly Disagree to 5 – Strongly Agree. The items were presented in statement form to give respondents weight to their perception of each item under each service quality dimension.

The data analysis used two techniques – exploratory factor analysis (EFA) and regression analysis. The EFA was used to reduce the 40 items to a few orthogonal ones that will represent the remaining items to identify the most important quality service factors for Johannesburg's e-hailing taxi services. EFA employs the variance of the variables to extract the common factors that explain customer satisfaction with e-hailing taxi service quality attributes. The EFA provides information about latent factors and estimates of the correlation between observed variables and their relationships with each unobserved variable. The EFA found reliability, safety, tangibility, and empathy as the common service factors determining customer satisfaction with e-hailing taxi services in Johannesburg.

The second part of the analysis is the regression of the extracted common factors by EFA with customer satisfaction. The regression model determines the extent and significance of the relationship between the extracted common factors and customer satisfaction. The data employed for the regression analysis were created by transforming the items that load significantly on each common extracted factor. The transformation for creating and computing the new variables was done by the mean of the significant items associated with the extracted common factors. Specifically, the mean of the items that form each common service quality factor was used to create new variables: reliability, safety, tangibility, empathy, and customer satisfaction. The regression analysis used customer satisfaction as the dependent variable and reliability, safety, tangibility, and empathy as the independent variables. This was done to determine how each variable affects customer satisfaction with the quality of e-hailing taxi services in Johannesburg.

The regression model for the study takes the form (1):

$$Y = a + BX_1 + B_2X_2 + BX_3 + B_4X_4 + e \qquad (1)$$

where:
Y = dependent variable,
$B_1 - B_4$ = coefficients of the independent variables,

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$X_1 - X_4$ = independent variables,
e = error term of the model.

Therefore, equation (1) transforms for this study as (2):

$$CuSa = a + B_1 Rel + B Tan + B_3 Saf + B_4 Emp + e \quad (2)$$

where:
CuSa = Customer Satisfaction,
Rel = Reliability,
Tan = Tangibility,
Saf = Safety,
Emp = Empathy,
B = Coefficient of the independent variables,
e = Error term.

4   Results

The study focused on assessing the service quality dimensions of e-hailing taxis that influence customers' satisfaction in Johannesburg. The study determines which service quality factors are the major determinants of satisfaction for e-hailing taxi services in Johannesburg.

The output of the analysis shows that the data is adequate and suitable for EFA with a KMO test value of .967 and Bartlett's Approximate Chi-Square 15608.468, which is significant at p<0.000. The result indicates that the final output of the analysis is reliable.

The communalities of the analysis presented in Table 1 show that all the study items will significantly contribute to the reduced e-hailing taxi service quality factors. This reflects the communalities result showing that the least value after extraction is greater than .500 (See Table 1). The values representing the variance of the items is the data's communalities. The communalities are determined by adding the squared loading values of the initial and extracted loadings. The values of the extracted communalities show that all the items have an acceptable variance that can explain the variability in the common factors for e-hailing taxi services in Johannesburg, except item A4, with .187 after extraction. It implies that item A4 will produce an insignificant contribution to the common service quality factors for e-hailing taxis in Johannesburg.

Table 1 Communalities of items for e-hailing taxi services

Indicators	Description of indications	Initial	Extraction
Reliability			
R1	When e-hailing taxi service providers pledge to resolve complaints within a specified time frame, they deliver.	.565	.544
R2	When you have a grievance, the taxi service provider is sincerely interested in solving it.	.595	.575
R3	The taxi driver will arrive on time for pickups and drops.	.625	.592
R4	The taxi driver understands the routes and locations for pickups and drops.	.613	.537
R5	There is convenience in taxi booking and taxi boarding (Ease, speed, vehicle availability).	.654	.577
Safety			
S1	Taxi service providers have convenient payment options.	.572	.582
S2	There is a low probability of an accident occurring.	.694	.695
S3	There is a low possibility of injury because of reckless driving.	.648	.663
S4	There are appropriate safety measures for both the client and the driver.	.743	.760
S5	Enough safety measures are taken, and the driver is vigilant.	.702	.716
Affordability			
A1	Fares are affordable.	.667	.581
A2	Fares guarantee value for your money.	.695	.602
A3	Fares are worth the efficiency that comes with e-hailing services.	.688	.612
A4	I can consistently afford the services weekly.	.276	.187
A5	Discount(s) is offered by e-hailing service.	.600	.532
Responsiveness			
RE1	The taxi service provider will notify the customer when passenger pickup or drop will be performed.	.651	.539
RE2	The taxi service provider will give prompt services to the customers.	.651	.578
RE3	Taxi drivers will never be too stubborn or busy to respond to customer requests.	.635	.583
RE4	The e-hailing taxi offers 24-hour service quality all the time.	.622	.552
RE5	Drivers are willing to answer the questions of customers.	.641	.607
Assurance			
AA1	Drivers are professional and follow traffic rules and regulations.	.700	.605
AA2	You feel safe and secure when riding a taxi.	.732	.638

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AA3	Drivers are consistently courteous with you.	.765	.678
AA4	Price is fairly consistent, and there is value for money.	.620	.534
AA5	Taxi service providers have driver, vehicle, and customer tracing capabilities in case of any issues arise.	.649	.547
Empathy			
E1	Taxi service providers have customer feedback options, driver rating options, and customer follow-up options.	.711	.592
E2	The taxi service providers will have operating hours convenient to the customer.	.697	.624
E3	Employees/Drivers are not mean and are attentive to you.	.713	.720
E4	Taxi drivers will always be willing to assist customers (boarding and luggage).	.713	.697
E5	Taxi service providers understand your specific needs.	.763	.750
Tangibility			
T1	Taxi vehicles are modern.	.751	.742
T2	Taxi vehicles' interior and exterior is visually appealing (Clean, Comfortable, Spacious, and Attractive).	.761	.728
T3	Taxi drivers usually appear neat.	.783	.768
T4	Taxi-related materials (receipts/statements) are visually appealing.	.707	.642
T5	The process of paying bills is easy and comfortable.	.681	.645
Customer Satisfaction			
CS1	Overall, I am satisfied with service of e-hailing services.	.734	.656
CS2	The e-hailing service provider performs better compared to other service providers.	.726	.669
CS3	In general, I am happy with the e-hailing service experience.	.728	.656
CS4	Requesting a ride was simple and convenient	.684	.655
CS5	Customer support service is available, e.g., post-service queries.	.705	.642

Extraction Method: Principal Axis Factoring.

The analysis took a further step to confirm the suitability of the data for the technique by determining the total variance explained by each item to identify the number of factors that can summarily explain the service qualities of e-hailing taxis. The analysis identified five (5) variables as common factors of e-hailing taxi services in Johannesburg. The identification follows the rule that items with an initial total eigenvalue greater than one (1) significantly contribute to forming the common factors. Table 2 shows that five (5) items with an initial total eigenvalue greater than one (1) accounted for 66.5 per cent of the total variance at extraction and 62 per cent after rotation to explain Johannesburg's common e-hailing service quality factors. The total percentage contribution confirms the suitability of the common factors to represent all the items. The information in Table 2 further provides the dimension for understanding the proportions of the variance of the items that form the common service quality factors of e-hailing taxis in Johannesburg. With this, at rotation, the percentage of the variance of the first common factor explained 17.55 per cent, the second factor contributed 15 per cent, the third factor contributed 11 per cent, the fourth factor explained 10 per cent, and the fifth factor contributed 8 per cent to describe the common service quality factors of e-hailing taxis in Johannesburg.

Table 2 Percentage of Total Variance of e-hailing taxi service

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	19.939	49.848	49.848	19.566	48.916	48.916	7.020	17.550	17.550
2	2.743	6.858	56.706	2.430	6.075	54.991	6.023	15.057	32.607
3	1.464	3.659	60.365	1.058	2.646	57.637	4.432	11.080	43.687
4	1.341	3.353	63.718	.992	2.479	60.116	4.047	10.118	53.806
5	1.122	2.806	66.524	.754	1.886	62.002	3.278	8.196	62.002
6	.984	2.460	68.984						
7	.930	2.324	71.309						

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8	.869	2.174	73.482							
9	.834	2.085	75.567							
10	.735	1.837	77.404							
11	.651	1.627	79.032							
12	.550	1.375	80.407							
13	.519	1.298	81.704							
14	.488	1.220	82.925							
15	.447	1.118	84.042							
16	.404	1.009	85.052							
17	.387	.967	86.019							
18	.370	.925	86.944							
19	.360	.899	87.843							
20	.341	.852	88.694							
21	.333	.831	89.525							
22	.315	.789	90.314							
23	.314	.785	91.100							
24	.309	.773	91.873							
25	.277	.691	92.564							
26	.271	.678	93.242							
27	.262	.655	93.897							
28	.247	.617	94.513							
29	.239	.599	95.112							
30	.231	.578	95.690							
31	.222	.554	96.244							
32	.205	.513	96.757							
33	.198	.494	97.251							
34	.189	.474	97.724							
35	.176	.440	98.164							
36	.163	.408	98.571							
37	.162	.404	98.976							
38	.146	.365	99.340							
39	.138	.345	99.686							
40	.126	.314	100.000							

Extraction Method: Principal Axis Factoring.

The common factors were extracted with principal axis factoring and varimax rotation to identify the latent items that form the common service quality factors. The rotation was done such that the values were presented according to size. The coefficients of the variables were also suppressed to 0.600 such that items with a coefficient of less than 0.600 are considered to have little contribution to the common factors of e-hailing taxi services in Johannesburg (See Table 3). The decided threshold of 0.600 is regarded as reliable for the study, irrespective of the sample size. [40, 41] advocated that factor loadings of at least 0.6 should be regarded as reliable irrespective of the sample size. A further consideration of Table 3 shows that the most significant e-hailing taxi service qualities determining customer satisfaction are reliability, tangibility, safety, and empathy. The significance of the finding is that all the safety items in the questionnaire have the highest loading factor and significantly determine the user's expectation and service performance of e-hailing taxis in Johannesburg. It implies that the safety dimension added to the model is highly important for transport service quality measurement.

An interesting output in Table 3 is that item A1 (fares are affordable) loads under customer satisfaction. It indicates that customers find issues about the affordability of transportation prices important to their perception of service satisfaction. This may explain why affordability is not among the common service factors in Table 3. It aligns with [42], who found a significant relationship between affordability and customer satisfaction. So, it implies that the masses in developing countries perceive the affordability of public transport as service satisfaction. It indicates the incorporation of the affordability service dimension into the customer satisfaction element, implying that affordability of the service is integral to customer satisfaction. That is, if transport service is not affordable, there would be no level of satisfaction.

Another interesting result of the analysis is that all the items considered under the safety factor significantly contribute to the qualities the respondents consider

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influencing their safety concerns about e-hailing taxi services. Other factors have some items excluded for their little contribution, which is considered insignificant. For customer satisfaction, CS1 was removed. For Reliability, R4 and R5 were excluded. T4 and T5 were excluded for Tangibility, and E1 and E2 were excluded under empathy. The retained items (See Table 3) significantly determine the respondents' perception of each factor.

Table 3 Rotated factors of e-hailing taxi services in Johannesburg

Indicators	Factor				
	1 – Customer Satisfaction	2 – Reliability	3 – Tangibility	4 – Safety	5 – Empathy
CS4	.670				
CS2	.652				
CS5	.643				
CS3	.620				
A1	.602				
R1		.643			
R3		.639			
R2		.636			
T1			.680		
T3			.678		
T2			.677		
S4				.834	
S5				.810	
S2				.802	
S3				.773	
S1				.673	
E3					.668
E4					.665
E5					.652
Reliability Statistics (Cronbach's Alpha)	.900	.841	.917	.910	.906

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

The reliability statistics of the items that form the common factors with very high Cronbach's Alpha values indicate that the items for each identified common factors are reliable in determining the service quality factors of e-hailing taxis in Johannesburg.

The second aspect of the analysis examines the relationship between the major e-hailing service quality factors and customer satisfaction using regression analysis. The major e-hailing service quality found by EFA are reliability, tangibility, safety, and empathy The analysis was conducted by subjecting the four (4) common service quality factors as independent variables to measure their effect on customer satisfaction (dependent variable) with e-hailing taxi services in Johannesburg.

The descriptive statistics of the regression analysis show the mean values of the variables for the study. Customer satisfaction has the highest mean of 3.821, tangibility has 3.716, empathy has 3.665, reliability has 3.629, and safety has 3.567. The output indicates that the data have an acceptable level of normal distribution for regression analysis.

The identified e-hailing service quality factors are naturally dependent on one another by the degree of relationship the respondents attached to them. The correlations matrix in Table 4 shows that the variables have a significant relationship with one another at $p < 0.000$. The correlations between the variables are positive and imply that an increase in the unit of one variable will yield an increase in the other. So, Table 4 implies that customers will tend to derive satisfaction from e-hailing taxi services as their perception of the common service quality factors increases. It is observed from Table 4 that customer satisfaction has very high significant relationships with the independent variables except with safety with $r = .474$. Other high correlation values are between tangibility and reliability ($r = .630$) and empathy and tangibility with $r = .661$. The results in Table 4 imply that patronage of e-hailing taxi services will continue to increase due to customers' satisfaction with the service quality factors. Table 4 indicates that the common service factors are associated positively with customer satisfaction.

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Table 4 Correlations matrix of e-hailing service quality factors

	CuSer	Rel	Tan	Saf	Emp
Customer Satisfaction (CuSer)	1.000				
Reliability (Rel)	.632	1.000			
Tangibility (Tan)	.692	.630	1.000		
Safety (Saf)	.474	.394	.380	1.000	
Empathy (Emp)	.650	.587	.661	.392	1.000

Table 5 presents the model summary of the multiple linear regression showing the strength of the relationship between the dependent and independent variables. The correlation coefficient, R, its square, R^2, the adjusted R^2 and the standard error of the estimate. In a regression model, the R^2 serves as the unit for measuring the predictive strength of the model. For the study, the model explains that empathy, safety, reliability, and tangibility account for most of the variance in customer satisfaction with e-hailing taxi services in Johannesburg.

Table 5 Model summary of e-hailing taxi service qualities

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.776[a]	.602	.599	.53677

a. Predictors: (Constant), Empathy, Safety, Reliability, Tangibility

The R^2 of .602 indicates that the variables explain 60.2 per cent of the variance in customer satisfaction with e-hailing taxi services in Johannesburg. It implies that 60 per cent of the changes in customers' satisfaction with e-hailing taxi services can be attributed to customers' perception of reliability, tangibility, safety, and empathy level of their service quality. The adjusted R square attempts to improve the estimation of R^2 in the population. The adjusted R square of .599 represents 59.9 per cent of the variance in the service quality factors determining customers' satisfaction with e-hailing taxi services in Johannesburg.

Table 6 provides the ANOVA test result of the regression analysis to determine whether the hypothesis that the major e-hailing service quality dimensions affect customer satisfaction should be accepted. The result shows an F-Test of 186.849 when the values of the independent variables are set at zero. The ANOVA test presents $F(4.494) = 187$ at $p = 0.000$, which brings to the conclusion that the e-hailing taxi service qualities of empathy, safety, reliability and tangibility significantly affect customer satisfaction.

Table 6 ANOVA test of e-hailing service quality factors

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	215.342	4	53.836	186.849	.000[b]
	Residual	142.333	494	.288		
	Total	357.675	498			

a. Dependent Variable: Customer satisfaction
b. Predictors: (Constant), Empathy, Safety, Reliability, Tangibility

The coefficient of the service qualities for e-hailing taxis in Johannesburg presented in Table 7 provides the estimates of the standardised and unstandardised coefficients of the regression, t-test values, significance level of the estimates and collinearity statistics of the model. The estimated coefficients to explain the effect of e-hailing taxi service qualities on customer satisfaction in this study take the "Unstandardized Coefficients B". It provides for each independent variable the predicted change in the dependent variable. So, it indicates that customer satisfaction with e-hailing taxi services will increase by 18,9%, 27.6%, 14.8% and 18.9% for every additional score for reliability, tangibility, safety, and empathy, respectively. This implies that the four major service quality indicators significantly determine customer satisfaction with e-hailing taxi services in Johannesburg.

Table 7 Coefficients[a] of service qualities factors of e-hailing taxi services in Johannesburg

Model	Unstandardised Coefficients		Standardised Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	.887	.115		7.748	.000		
Reliability	.189	.034	.215	5.538	.000	.536	1.864
Tangibility	.276	.034	.338	8.170	.000	.470	2.129
Safety	.148	.028	.169	5.316	.000	.798	1.254
Empathy	.189	.032	.234	5.855	.000	.503	1.986

a. Dependent Variable: Customer Satisfaction

The collinearity statistics of the analysis with the Tolerance and VIF values indicate no issue of multicollinearity with the model. The VIF value for the four variables is greater than 1.00, while their corresponding Tolerance values are more than 0.1. It implies that the regression analysis output is reliable for predicting the effect of reliability, tangibility, safety, and empathy on customers' satisfaction with e-hailing taxi services in Johannesburg.

5   Discussion of results

The flow of public passenger transport in urban centres is characterised by various land use patterns and public

infrastructure. The land use centres attract the flow of people who are public transport service passengers. However, the qualities of public transport services influenced the passenger flows to the land use centres. This study provides insight into the service quality factors that users of e-hailing taxi services consider most important to their satisfaction. High quality of service within an industry or organisation has been regarded as an essential means of building customer retention and loyalty for business growth [43,44]. It implies that an organisation or business will continue to grow as much as it can sustain high service qualities of its products based on its capacity to provide customer satisfaction and retention.

This study identified the most important service quality attributes to users of e-hailing taxis and determined the extent of their influence on satisfaction with the services in Johannesburg. The study found reliability, tangibility, safety, and empathy as important service quality dimensions that promote e-hailing taxi services and significantly influence user satisfaction in Johannesburg. Reliability has been a key dimension of assessing service qualities of public transportation in different countries. That this study found reliability as a significant service quality factor for e-hailing taxi services in Johannesburg is similar to other studies. In Nigeria, [45] found the importance of reliability for public transportation in Kogi State as customers' expectation exceeds their perceived reliability. In Ethiopia, [46] explored the passengers' satisfaction with HIGER city bus services. [47] also found the reliability and tangibility dimensions of public transport service quality as the largest contributor of service quality to customer satisfaction. The study by [48] in Malaysia also supports the finding that reliability and tangibility dimensions of service quality factors significantly affect customer satisfaction. In the UK, [49] recommended reliability improvements to increase public transport passengers' perceived satisfaction. Numerous other studies have identified reliability as a significant public transport service quality factor influencing customer satisfaction. The finding implies that e-hailing service users regard the pickups and drop-offs to be on time, the vehicles are available when required, and they can rely on the providers to resolve conflicts. When the drivers achieve the foregoing, the users are satisfied with the e-hailing taxi service. Practically, e-hailing taxi operators work round the clock, making the users call for service at any time of the day, unlike the traditional public taxi services, which do not work at night seasons.

The fact that tangibility is a major significant e-hailing taxi service quality for customer satisfaction in Johannesburg is compelling. The users consider the tangibility of e-hailing taxi services regarding the physical appearance of vehicles [50] and the drivers. This result aligns with several authors who have worked on transport service qualities in different cities [27-30]. Users of e-hailing taxi services will be satisfied with the service when the vehicles are in good condition, appear neat, and the driver is smart and professional.

Safety is a major transport service dimension, including security concerns, which this study added to assess the quality of e-hailing taxi services in Johannesburg. In fact, it is unsurprising that users of e-hailing taxi services accord significance to safety as a service quality measure. This will arise from the safety concern of the users since public transportation has a higher safety risk because it usually carries more than one non-related person in a car [51]. In line with this study, [52] applied AHP to service quality factors and found that safety has the most significant weight for bus services in the Philippines. [53] found that a significant indirect relationship exists between safety and public transport quality in selected European cities. The concern makes it important that safety should be included as a service quality indicator for public transportation. The violent attacks from traditional meter taxis, carjackings and transport-related crimes in Johannesburg make safety a smajor concern among users of e-hailing taxi services. The major e-hailing services such as Uber and Bolt have been increasing the safety measures on their apps, including a safety tool kit to make it easier for users to contact emergency services. Including safety measures make users more satisfied with the e-hailing service.

Empathy, the capacity to absorb and understand the feelings of others, is an important service quality factor of e-hailing taxis expected by the users. The finding of this study regarding empathy aligns with [54] study, which found that empathy has a cause-and-effect relationship with passengers' satisfaction with public transportation. Often, passengers demand e-hailing taxi services to meet a need, which dictates their feelings. It implies that operators of e-hailing taxi services in Johannesburg are expected to study and understand the feelings of the respective passengers, which are diverse and unique to individuals. Likewise, [52] found that reliability and empathy significantly affect public transport service quality and customer satisfaction.

Therefore, the important service quality measures of e-hailing taxi services for user satisfaction in emerging cities are tangibility, empathy, reliability, and safety. This study highlights that while the traditional SERVQUAL model applies in other industries and contexts, the e-hailing taxi industry in Africa can apply a modified four-dimension model to measure satisfaction. Thus, service quality positively affects user satisfaction with e-hailing taxi services.

6   Conclusion and recommendation

This study investigated the service qualities of e-hailing taxis and customer satisfaction in Johannesburg. The study identified the most important service quality elements to e-hailing taxi users as tangibility, empathy, reliability, and safety. Further, a positive relationship was established between service quality and e-hailing taxi service user satisfaction. The other traditional dimensions, viz. assurance and service quality responsiveness were irrelevant to user satisfaction with the e-hailing taxi service. Interestingly, the study established that customers

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considered the affordability of e-hailing taxi services for satisfaction. Also, the study found safety a major quality dimension for e-hailing taxi services in Johannesburg. This is primarily due to the constant robbery and other attacks that public transportation passengers face. Therefore, the managerial policy recommendation from the study provides that e-hailing taxi companies need to pay attention to the safety of their passengers by ensuring responsive vigilance with sound safety measures to build the safety perception of prospective customers of the service. The service providers may need to employ advanced technology to enhance their safe operations.

The study contributed to the existing literature by identifying that e-hailing taxi customers consider service reliability, tangibility, safety, and empathy as the most important for their continuous patronage and satisfaction. So, this study successfully highlighted the four important service quality dimensions that need to be investigated for e-hailing taxis. The study is limited to e-hailing taxi services in Johannesburg. Further, studies can replicate the study in other cities of developed and developing nations. In addition, further studies need to investigate the significance of the four service quality dimensions in other modes of public transportation.

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