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Determining Factors Affecting Perceived Customer Satisfaction on Public Utility Bus System in Occidental Mindoro, Philippines: A Case Study on Service Quality Assessment during Major Disruptions

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Abstract: The imposition of lockdown due to the COVID-19 pandemic has affected the majority of enterprises throughout the globe. The public transportation sector was greatly affected, especially in provincial areas in the Philippines. This study aimed to investigate the service quality of bus transits in Occidental Mindoro during the COVID-19 pandemic using Analytical Hierarchy Process (AHP) and SERVQUAL dimensions. A total of 200 individuals completed a 67-question online questionnaire. AHP was utilized to determine which bus providers need to be improved the most. Then, the SERVQUAL approach was used. The five dimensions were linked with the use of new technologies, including the COVID-19 protocol, service quality, and customer satisfaction as latent variables in structural equation modeling. The AHP results indicated that safety accounts for the most significant weight for bus passengers. Moreover, service quality, responsiveness, reliability, empathy, and COVID-19 protocol significantly enhance service and customer satisfaction. The findings of this research study can now serve as a service quality assessment and guidelines to provide a sustainable public bus transportation; it can also help determine the significant and insignificant factors in enhancing the service quality and improving the customer satisfaction of bus providers worldwide.

Keywords: bus public transport; service quality; customer satisfaction; COVID-19; AHP; MCDM; MCDA

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1. Introduction

Passengers in the Philippines use public utility vehicles such as buses and vans to travel easily between cities and provinces [1]. Because few Filipinos possess vehicles, public transportation is their only practical mode. However, due to COVID-19, only 50–75% capacity has been allowed for public transportation [2]. Moreover, for the passengers to protect themselves from COVID-19, the government added additional guidelines for using public transportation. These guidelines call for more frequent and restrictive sanitizing of vehicles and floors, temperature checks for employees and, in some cases, passengers, and improved ventilation of facilities and vehicles [3].

According to Chuenyindee et al. [4] and Cahigas et al. [5], passengers' behavior, expectations, and perceptions were affected by the contagious effect of COVID-19. Identifying the factors that affect the behavior, anticipation, and perception of the passengers is critical as they are the primary users of public vehicles. Hence, they play a very vital role. Numerous studies have revealed that external and internal factors affect passengers' behavior and satisfaction, including crisis management, safety, accessibility, economic benefit, emotions, and opinions such as attitude, trust, subjective norm, intention, and perceived behavioral control [4]. Due to numerous variables affecting the passengers' behavior and satisfaction, a multivariate statistical tool is crucial to determine the significant relationship among the variables.

Customer satisfaction is the primary factor of long-term financial performance for public transportation providers; hence, understanding passengers' behavioral intentions and perceptions is significant [6]. In the public transportation system, achieving a high level of customer satisfaction is a crucial task for executives and officials [7]. Several public transportation providers in the Philippines, particularly in the province of Occidental Mindoro, have grown more aware of customer satisfaction's critical role in increasing public transportation usage. Occidental Mindoro is one of the developing provinces in the Philippines. Currently, passengers in the province use public utility vehicles such as buses to travel in and out of the region. One of the best assessment tools for measuring customer satisfaction in different fields is the service quality Model (SERVQUAL).

SERVQUAL is a method of rating service quality widely used in marketing and business. According to Marco-Laraja et al. [8], this method is an essential tool for assessing customer satisfaction. During the COVID-19 pandemic, the SERVQUAL method was widely used to evaluate service quality in a variety of sectors, including e-learning [9], healthcare [10], and even marketing [11]. Because the focus of SERVQUAL is to analyze the effectiveness of service provided by the firm to improve customer satisfaction [12], the need to evaluate the new normal living situation should be examined to generate a reference point or a reference standard as to how companies such as public transportation providers should operate during the COVID-19 pandemic. To survive in today's highly competitive, dynamic, and complex environment, continuous service improvement is required for business development [13]. Hence, for the company to be at par, knowing the ranking of the company in the business world is also essential. One of the multi-criteria decision analyses (MCDA) techniques used by the researchers to determine the rank of the alternatives with several criteria is the Analytical Hierarchy Process (AHP). AHP was formulated by Saaty [14], and this method can help obtain the best decision among several alternatives while considering different parameters [15]. With the various bus providers in the provincial set-up, it is necessary to determine if the passengers are satisfied with the services provided.

However, there are few studies regarding the customer satisfaction assessment of local buses in a provincial set-up. Hence, in this current study, it is essential to determine the service quality dimension that significantly affects customer satisfaction. In addition, ranking the public utility bus providers was also one of the objectives to assess further the public utility bus providers in the province, which was not performed in other related studies. Furthermore, this research aims to evaluate the quality management of public bus transportation in Occidental Mindoro in terms of tangibility, responsiveness, reliability, assurance, and empathy to help contribute to the province's economic development.

The contributions of this study are as follows: (1) The integration of MCDA and the SERVQUAL model through structural equation modeling to analyze the system of public utility bus providers in a provincial set-up. Filipinos continuously ask for a better public transportation system, but due to COVID-19, the transportation sector is still affected. Mitigation can be proposed using the principles used in this study; (2) Identification of the criteria and the preferences of the passengers using public utility buses; (3) identification of the gap between the expectations and perceptions of the passengers; (4) identification of the significant factors affecting the service quality and customer satisfaction of a public utility bus system; and lastly, (5) practical recommendations can be derived from the study to propose recommendations for policy-making and establish a systematic public utility bus for the service providers in the province.

2. Literature Review

It is undeniable that the COVID-19 pandemic forced public utility vehicle passengers to adapt to the new standard set-up. Numerous studies were conducted to assess different public transport models and determine the negative or positive impact of the fresh set-up. One study focused on the service quality and customer satisfaction of public utility vehicles in the Philippines and found that tangibility and assurance significantly affect customer

satisfaction and service quality [4]. Another is the study conducted by van Wee and Witlox [16], which discovered that the passengers who used to ride public transportation opted to use private vehicles and considered walking and cycling. Several types of research in Australia and the USA revealed that due to COVID-19, the number of passengers using public transportation decreased [17]. In addition, the situation will continue even after the virus is gone since most passengers prefer to use private cars [18].

According to Liou et al. [19], service quality positively influences customer performance expectations. It is used to evaluate a customer's inclination to select a particular method of transportation. They established that customer satisfaction leads to consumer loyalty and retention. According to their research, customer expectations mediate between image and loyalty. Deveci et al. [20] used fuzzy quality function deployment to evaluate the service quality of commercial buses.

On the other hand, their research aimed at creating a quantitative assessment system. According to Guirao et al. [21], passenger satisfaction surveys are routinely used to measure service quality in public transportation. They underlined that limiting the questionnaire would be the most effective way of evaluating service quality. The study's emphasis has been on establishing a new technique for assessing service quality through various concepts.

A past study in Turkey about bus passengers and the bus system revealed that bus providers must meet the demands of the passengers, such as the capacity, scheduling, and real-time tracking. It was also discovered that the waiting time, travel time, and environment were the preferences of the passengers [22]. In China, authors found that poor ventilation of the bus system plays a significant role in virus transmission [23]. In India, researchers discovered that cleanliness is essential for the passengers [24], while in Vietnam, the bus providers must follow the COVID-19 protocol to consider using the public bus [25]. This proves that passengers believe in different criteria for riding public vehicles.

Past researchers also assessed the travel behavior of passengers in the Philippines. It was revealed that demographic characteristics such as age, salary, and gender were statistically significant in traveling. Filipinos also stopped traveling during the pandemic and preferred to buy necessities after a year of the pandemic [1]. Also, researchers found that due to the pandemic, passengers lost the intention to use public transportation [26]. In Japan, a study showed that travel behavior changed due to social influence and risk perception. People only chose public transit for essential activities [27]. People in Iran also became uncomfortable traveling around with many people, and passengers preferred to sit farther from other passengers on board [28].

Further, the SERVQUAL model has been successfully utilized in different areas by several scholars. This model was used in assessing online payment in an electric company [29], in a fast food restaurant [30], in shopper's behavioral intentions in urban shopping malls during the COVID-19 pandemic [31], and in determining customer satisfaction in urban transportation in the Philippines [32]. Yet, none of the scholars used this model in assessing customer satisfaction in the utility bus system.

Most of the presented related studies focused on the effects of COVID-19 in the transportation sector for the short and long term. In addition, researchers focused on the changes in the attitude of passengers using public transportation. In the Philippines, studies have mainly focused on the social exchange theory and theory of planned behavior that has been applied primarily in the cities. However, none of the studies used a multi-criteria decision analysis (MCDA) to rank the preferences of the bus passengers in provincial areas or utilized the SERVQUAL model to determine the gap between passengers' expectations and perceptions. Using a specific methodology concerning several criteria, MCDA ranks all the options to select the best alternative [33]. In recent years, MCDA techniques such as the Analytic Hierarchy Process (AHP), Analytic Network Process (ANP), Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), Complex Proportional Assessment method (Copras), and Best Worst Multi-criteria method (BWM) have been used in different fields. Among these methods, AHP was used by most of the researchers in diverse areas, such as site selection [34], vaccine selection [35], selecting parameter-influencing testing in

software development [36], and financial performance modeling in retail companies [37]. In essence, AHP makes complex problems simpler. The decision-maker learns about the nature and components of the problem. This technique also includes both subjective and objective points of view in the decision-making process.

Furthermore, compared to other strategies, it is more appropriate for group decisions. Coordinating different perspectives to form a general group opinion is essential in deciding [38]. It is a mathematical technique that considers preferences while making decisions and may simultaneously assess qualitative and quantitative elements [39].

The SERVQUAL model and AHP technique will serve as a guide for public bus operators and providers to improve the services and to offer a sustainable public bus system in the provincial area to further recover from the losses they experienced because of the pandemic. With these presented gaps, including the MCDA and SERVQUAL model through SEM was a new and exciting topic to focus on.

3. Methods

3.1. Conceptual Framework

From the objectives of this study, the type of research is explanatory research. The detailed research design is shown in Figure 1. To gather the necessary data, the proponents conducted observations and interviews. The Analytical Hierarchy Process (AHP) was used to rank the top five bus transit routes in Occidental Mindoro. Following the ranking, survey questionnaires were distributed. The survey questionnaires were all related to the multi-criteria decision analysis and SERVQUAL dimensions such as tangibility, responsiveness, reliability, assurance, and empathy, which also served as latent variables, including COVID-19 protocols, utilization of new technology, and service quality, that will be used in evaluating customer satisfaction. SERVQUAL and structural equation modeling was utilized to analyze the collected data. AMOS 22 and IBM SPSS were used to identify statistical relationships between latent variables. For structural equation models (SEM), Kline [29] suggests that, at a minimum, the following indices should be reported: the model RMSEA, the CFI, and the SRMR.

Figure 2 illustrates the conceptual and theoretical framework analysis for this study. This framework was based on the Disconfirmation of Expectations theory. The customers' happiness and satisfaction are a function of perceived performance and perceived disconfirmation, with the perceived disconfirmation as reliant on perceived performance and comparison standards. The industry norms, expectations, competitions, ideals, and promises can be used as the basis for the comparison. Moreover, it is well known that the initial expectations shape the customer's mentality. Thus, customers will not be satisfied if the performance does not meet the reference standard.

On the other hand, positive feedback can occur when the performance exceeds expectations. According to this theory, contentment is proportional to the magnitude and direction of the disconfirmation experience [30]. Using these statements, the following hypotheses were identified:

H1. *There is a significant relationship between tangibility and service quality.*

H2. *There is a significant relationship between responsiveness and service quality.*

H3. *There is a significant relationship between reliability and service quality.*

H4. *There is a significant relationship between assurance and service quality.*

H5. *There is a significant relationship between empathy and service quality.*

H6. *There is a significant relationship between COVID-19 protocol and service quality.*

H7. *There is a significant relationship between the utilization of new technology and service quality.*

H8. *There is a significant relationship between customer satisfaction and service quality.*

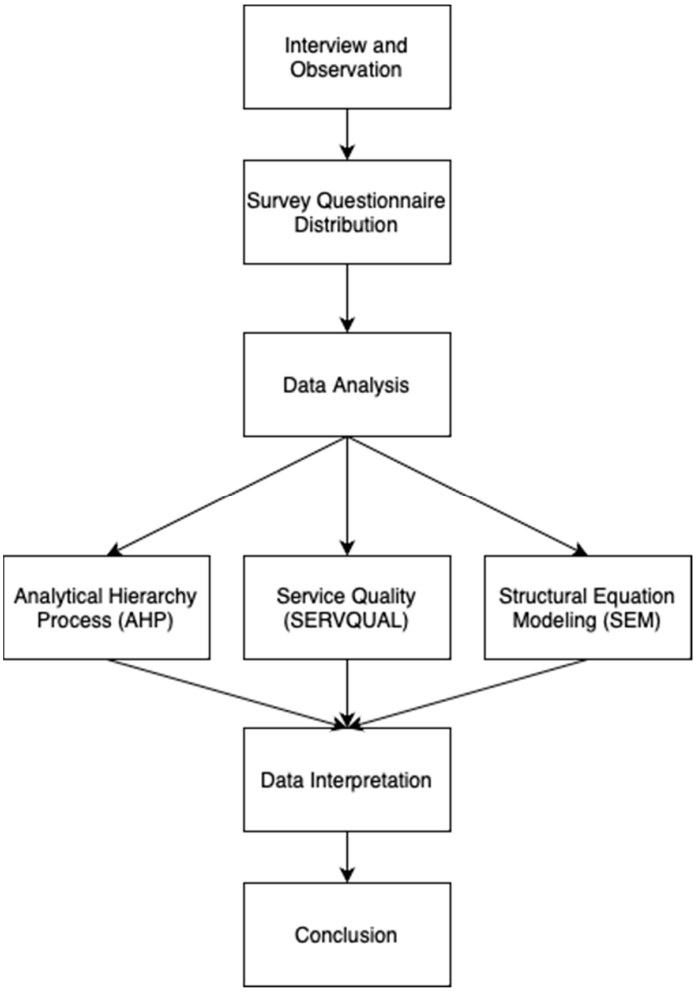

Figure 1. Research design.

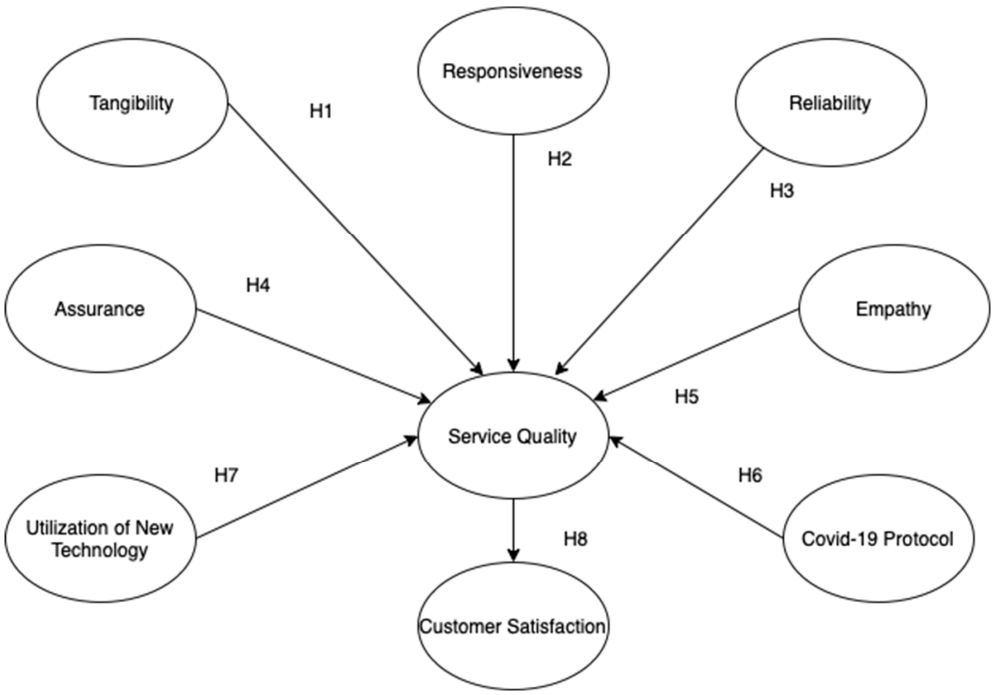

Figure 2. Conceptual framework of the study.

3.2. Participants

The researchers collected data from bus transit passengers who regularly use the bus in Occidental Mindoro, Philippines, through observation, interviews, and questionnaires. The link for the survey questionnaire was distributed through messenger, and manual distribution was also executed due to internet connection problems in the province from 3 January 2022 to 31 March 2022. According to Kline, 200 observations [40] will be used to obtain a reliable estimate [41].

Table 1 shows the descriptive statistics of the participants. The result describes that among the 200 participants, 52.5% were female and 47.5% were male. Approximately 49% were between 18 and 29 years of age, 23% were between 30 and 39, 15% were between 40 and 49, 12.5% were between 50 and 59, 0.5% were between 60 and 69, and 0% were 70 years and above. Further, 2.5% were elementary graduates, 18.5% were high school graduates, 48.5% were senior high school graduates, 6% were technical/vocational graduates, 22.5% were baccalaureate/college graduates, 0.5% were post-baccalaureate, 0% were special education undergraduate graduates, 0% were special education graduates, and 1.5% were no grade completed. In addition, most participants were from the Municipality of San Jose at 45%, followed by Sablayan at 21.5%, Rizal at 7.5%, Mamburao at 7%, Magsaysay at 6%, Sta. Cruz with 4%, Abra de Ilog with 3.5%, Calintaan with 2%, and Looc, Lubang, and Paluan with 1%. With regards to salary, most have a monthly salary/allowance of less than PHP 15,000, which is approximately 82.5% of the participants; 17% have a monthly salary/allowance of PHP 15,000–PHP 30,000, 0.5% of them have a monthly salary/allowance of PHP 30,000–PHP 45,000, 0% of them have a salary of PHP 45,001-PHP 60,000, and 0% have a wage of PHP 60,001–PHP 75,000.

Table 1. Descriptive statistics of the participants (n = 200).

Characteristics	Category	N	%
Gender	Male	95	47.5%
	Female	105	52.5%
Age	18–29	98	49%
	30–39	46	23%
	40–49	30	15%
	50–59	25	12.5%
	60–69	1	0.5%
	70 and over	0	0%
Educational Background	Elementary graduate	5	2..5%
	High school graduate	37	18.5%
	Senior high school graduate	97	48.5%
	Technical/vocational graduate	12	6%
	Baccalaureate/college graduate	45	22.5%
	Post-baccalaureate graduate	1	0.5%
	No grade completed	3	1.5%
	Special education (undergraduate)	0	0%
	Special education (graduate)	0	0%
Municipality	Abra de Ilog	7	3.5%
	Calintaan	5	2.5%
	Looc	2	1%
	Lubang	2	1%
	Magsaysay	12	6%
	Mamburao	14	7%
	Paluan	2	1%
	Rizal	15	7.5%
	Sablayan	43	21.5%
	San Jose	90	45%
	Sta. Cruz	8	4%
Monthly salary	Less than PHP 15,000	165	82.5%

Table 1. *Cont.*

Characteristics	Category	N	%
	PHP 15,001–30,000	34	17%
	PHP 30,001–45, 000	1	0.5%
	PHP 45,001–60,000	0	0%
	PHP 60,001–75, 000	0	0%
	Above PHP 75,000	0	0%

3.3. Questionnaire

To assess the public bus in the province of Occidental Mindoro during the COVID-19 pandemic, researchers developed a self-administered questionnaire from different related studies. The survey questionnaire consists of 67 questions with nine sections: (1) tangibility; (2) responsiveness; (3) reliability; (4) assurance; (5) empathy; (6); utilization of new technology (7) COVID-19 protocol; (8) service quality, and (9) customer satisfaction, as shown in Table 2. Every question was created to attain the objectives of this study, and they helped the researchers evaluate the participants' perceptions regarding the service quality of the public bus in Occidental Mindoro. This research implemented five Likert-type scales to determine the extent of responses with numerical equivalent and interpretation: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree [42].

Table 2. The constructs and measurement items.

Constructs	Item	Measures	Supporting Measures
Tangibility	T1	The seats are clean	[43]
	T2	Information on the route and schedule of the bus transit is understandable	[44]
	T3	Driver/conductor attire is neat and smart	[45]
	T4	The temperature and ventilation system on bus transit is good	[46]
	T5	There is a television in the bus transit	[46]
	T6	There are no disturbing vibrations inside the bus transit	[47]
	T7	Bus transit has ample legroom and foot space	[45]
Responsiveness	RS1	The driver/conductor is very responsive and ready to stop at the desired location of the passenger	[45]
	RS2	Conductors are always willing to help passengers	[45]
	RS3	Communication with the passenger is clear and helpful	[45]
	RS4	The driver/conductor is responsive and ready to prompt the desired stop	[44]
	RS5	Driver/conductor independently solves emerging issues and does not try to shift the responsibility to third parties	[44]
	RS6	Bus transit vehicles are easily accessible in my area	[48]
	RS7	Bus transit vehicles provide fast and reliable service	[49]
Reliability	RL1	Bus transit always arrives at the destination on time	[50]
	RL2	There are benches and shelter available at the loading and unloading areas	[51]
	RL3	The cost of the ride is affordable	[48]
	RL4	Passengers can book the tickets easily	[45]

Table 2. *Cont.*

Constructs	Item	Measures	Supporting Measures
	RL5	Personnel does not short-change passengers	[44]
	RL6	Bus transit stops at all stations	[44]
	RL7	Bus transit never breaks down on the road	[50]
Assurance	A1	The passengers feel safe in their transactions with the staff	[45]
	A2	The driver and conductor are always polite	[45]
	A3	The drivers adhere to a careful driving style	[44]
	A4	The driver and conductor provide equal service to all passengers	[52]
	A5	The driver and conductor have in-depth occupational knowledge of their jobs	[50]
	A6	The behavior of the driver and conductor instills confidence in the passengers	[50]
	A7	The passengers' luggage is safe and secure	[45]
Empathy	M1	The driver/conductor makes the customers feel extremely good as their needs are carefully taken care of at the point of the service delivered	[53]
	M2	Drivers and conductors can put themselves in the customers' position	[54]
	M3	Operators feel what their customers are experiencing and consider this in designing and delivering experiences	[55]
	M4	Drivers and conductors are involved in helpful actions toward customers, such as interpersonal concern and emotional contagion	[56]
	M5	Bus transit operators are friendly, fair, precise, and have good ethics	[57]
	M6	Operators are providing customers with their undivided attention when listening to their concerns	[58]
	M7	Operators have some humanity that supports interactions	[58]
Utilization of new technology	UT1	The bus transit operators display the ability to deliver the promised services through improved technology, upgraded equipment, or proper uniforms	[59]
	UT2	Bus transit uses mobile ticketing and payment options, information services through the internet, or self-service ticket vending machines	[60]
	UT3	Bus transit providers introduce new ways of service delivery and customer service as information and mobile technology develop rapidly	[61]
	UT4	Customers make the point-to-point service request from a mobile device at any time and from anywhere	[62]
	UT5	Bus transit providers improve the function of the entire transport system	[63]

Table 2. *Cont.*

Constructs	Item	Measures	Supporting Measures
	UT6	Utilizing new technology will improve service delivery, thus reducing the existing barriers towards public transportation and resulting in the general population being more patriotic to public transportation systems	[64]
	UT7	Automation provides an opportunity to ensure high-performance/higher-speed operations by leveraging technology rather than expensive infrastructure	[65]
COVID-19 Protocol	CP1	Drivers and conductors are both wearing facemasks and gloves all the time	[2]
	CP2	Passengers are required to wear facemasks to be allowed to board	
	CP3	Drivers/conductors collect payment at the front seat before allowing the passenger to board	
	CP4	Bus transit follows the point-to-point operation	
	CP5	Bus transit is equipped with a thermal scanner for checking body temperature	
	CP6	Bus transit disinfected every end of the trip, with all surfaces (especially seats, armrests, and handles) wiped down with a disinfecting agent	
	CP7	Operators/drivers provide foot disinfectants for passengers before boarding	
	CP8	Driver compartments are sealed off from the passenger area using a non-permeable, transparent material	
	CP9	Safety officers regularly examine the driver's and conductor's fitness to work by checking their temperature, among other measures	
	CP10	When the driver/conductor shows symptoms of COVID-19, they are prohibited from reporting to work	
	CP11	Bus transit is posting infomercials and posters reminding commuters of good sanitation practices	
Service Quality	SQ1	Overall, bus transit provides me with a safe environment	[66]
	SQ2	The bus transit follows all traffic laws	[66]
	SQ3	Overall, the services offered by bus transit are worth their price	[67]
	SQ4	Overall, bus transit meets my preferences	[68]
	SQ5	I am optimistic about the overall quality of service provided by the bus transit	[69]
	SQ6	I have lesser problems with the overall bus transit	[70]
	SQ7	Bus transit services exceed my expectations	[71]
Customer Satisfaction	CS1	I am encouraged to use bus transit	[72]
	CS2	Overall, I am satisfied with the bus transit service	[73]
	CS3	I will most likely utilize bus transit again	[73]

Table 2. *Cont.*

Constructs	Item	Measures	Supporting Measures
	CS4	I have great experience riding in bus transit	[74]
	CS5	Overall, I am impressed with the bus transit service	[71]
	CS6	I am willing to recommend the bus to my friends and relatives	[71]
	CS7	I have a positive mindset while riding in a bus transit	[69]

3.4. Analytical Hierarchy Process (AHP)

One of the most extensively used multi-criteria decision analysis techniques is the Analytical Hierarchy Process (AHP). This is based on the human ability to make decisions and judge different problems [14]. Using AHP, the hierarchy of goals, criteria, and several alternatives must be constructed. The decision-makers will make a pairwise comparison matrix, in this case, the passengers who use the bus and van transits. Using AHP, the ranking will then be determined and express how one alternative outranks the others. The consistency ratio (CR) is also calculated for each constructed pairwise comparison judgment matrix. This ratio is generally expected to be less than 0.1 to be acceptable. However, a CR of about 0.2 or less may be tolerated [14].

3.5. Service Quality

The service quality (SERVQUAL) model was developed by Parasuraman et al. [75] and is considered one of the best assessment tools to measure the quality of services offered by different companies in various fields. According to Asutenborg et al., 1996, this model aims to determine the gap between the expectation and the perceptions of the customers' experience in five dimensions: tangibility; responsiveness; reliability; assurance; and empathy. By determining the gaps, several recommendations were proposed to improve the service quality of the public utility vehicles in the province of Occidental Mindoro.

3.6. Statistical Analysis—Structural Equation Modeling

The collected data from the 200 participants were analyzed using structural equation modeling (SEM). This powerful statistical technique utilizes several methods incorporating path analysis, analysis of variance, factor analysis, multiple regression, and covariance [76]. According to Savari [77], SEM is suitable to use whenever the researchers want to test a research theory and when modeling the cause and effect of different variables of the constructed hypotheses. Various SEM software packages are available, such as EQS, LISREL, and AMOS. However, the model for this study was obtained using AMOS 22 with a maximum likelihood approach to estimate the parameters and acquire a total model estimation with the nine latent variables [78].

4. Results

According to the results of observations, interviews, and survey questionnaires, the researchers discovered that the passengers have five criteria for ranking bus preferences: travel cost, travel time, waiting time, accessibility, and safety. Table 3 shows the AHP normalized pairwise comparison matrix of the top five bus providers from the data gathered.

Table 4 shows the preference vector of the AHP from five criteria for the top five bus providers in Occidental Mindoro province. The results revealed that the travel cost accounts for 26.3%, travel time for 11.1%, waiting time for 4%, accessibility for 8.6%, and safety for 50%.

Table 3. AHP pairwise comparison matrix.

Criteria	Travel Cost	Travel Time	Waiting Time	Accessibility	Safety	Average
Travel cost	0.150	0.279	0.348	0.421	0.115	0.262
Travel time	0.050	0.093	0.173	0.140	0.096	0.110
Waiting time	0.018	0.023	0.043	0.018	0.096	0.040
Accessibility	0.025	0.047	0.174	0.070	0.115	0.086
Safety	0.754	0.558	0.261	0.351	0.577	0.500

Table 4. AHP preference vector.

Criteria	Travel Cost	Travel Time	Waiting Time	Accessibility	Safety	Weighted Sum Value	Preference Vector	Ratio
Travel cost	0.263	0.332	0.319	0.517	0.100	1.531	0.263	5.826
Travel time	0.877	0.111	0.159	0.172	0.083	0.614	0.111	5.541
Waiting time	0.033	0.028	0.040	0.022	0.083	0.205	0.040	5.151
Accessibility	0.044	0.055	0.159	0.862	0.100	0.445	0.086	5.160
Safety	1.314	0.664	0.239	0.431	0.500	3.149	0.5	6.295

To check the consistency of the results of the survey, Table 5 shows the effect of computation of the consistency ratio (CR), consistency index (CI), and random index (RI). The consistency ratio is 0.094, which is less than 1, which means that the survey result was consistent and valid.

Table 5. Consistency checking table.

Number of alternatives	5
Consistency index	0.149
Random index	1.580
Consistency ratio	0.094

The result shows in Table 6 that the best bus transit in Occidental Mindoro is bus transit 4 which has a percentage of 34.783974 or approximately 35 percent. Next in line is bus transit 5 with 31.8 percent, bus transit 1 with 16.5 percent, bus transit 2 with 9.5 percent, and bus transit 3 with 7.3 percent. The criteria were also proven consistent as the CR value is less than 0.1.

Table 6. Hierarchy ranking result.

Preference Vector	**0.263**	**0.111**	**0.040**	**0.086**	**0.500**		
Criteria	**Travel Cost**	**Travel Time**	**Waiting Time**	**Accessibility**	**Safety**	**Percentage**	**Final Ranking**
Bus Transit 1	0.148	0.185	0.297	0.189	0.155	0.165	3
Bus Transit 2	0.091	0.088	0.145	0.147	0.086	0.095	4
Bus Transit 3	0.094	0.059	0.088	0.105	0.058	0.073	5
Bus Transit 4	0.438	0.300	0.069	0.128	0.372	0.348	1
Bus Transit 5	0.229	0.372	0.401	0.431	0.323	0.318	2

The SERVQUAL gap in Table 7 identifies gaps between customers' expectations and the service offered. Tangibility has the most significant gap in this table, with a score of −0.9557, showing that consumers' expectations about the physical aspects of bus transportation providers diverge significantly from what they experienced. Customer satisfaction has the lowest gap, with a score of −0.5507.

Figure 3 shows the initial structural equation modeling. Based on the figure, three hypotheses were not significant, namely Hypothesis 1 (service quality to tangibility), Hypothesis 4 (service quality to assurance), and Hypothesis 7 (service quality to utilization of

new technology). As a result, a revised SEM was generated by removing these assumptions, as shown in Figure 4. Following several studies that used the SEM technique [67], various modification indices were used to improve the model fit.

Table 7. SERVQUAL gap.

Dimensions	Gap
Tangibility	-
Responsiveness	−0.5993
Reliability	−0.6893
Assurance	−0.6121
Empathy	−0.6171
Utilization of new technology	−0.6914
COVID-19 protocol	−0.7255
Service quality	−0.6329
Customer satisfaction	−0.5507

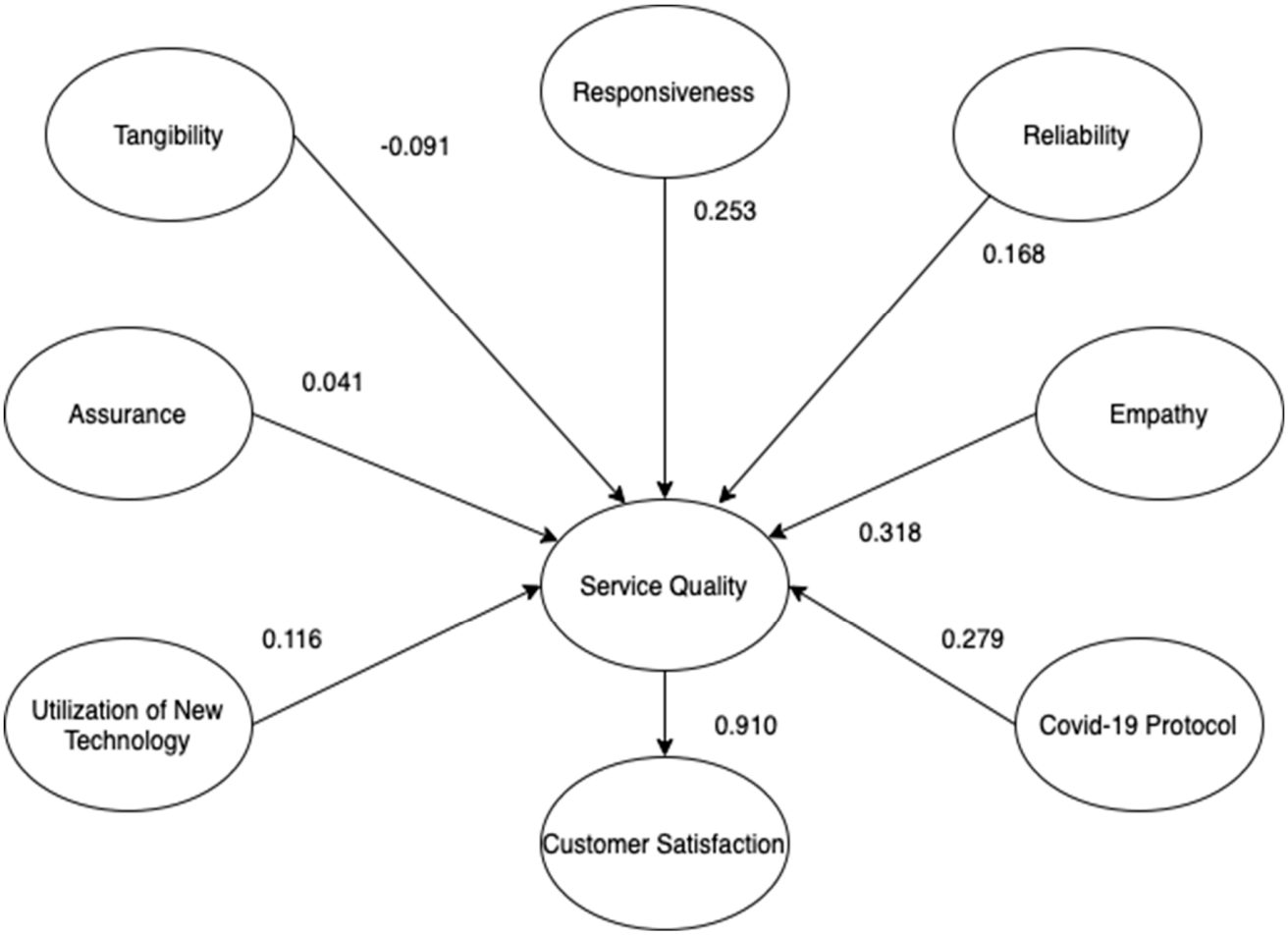

Figure 3. Initial structural equation model.

Table 8 shows that Cronbach's alpha of nine latent variables is more significant than 0.7. The average variance extracted from tangibility, responsiveness, reliability, service quality, and customer satisfaction are 0.4729, 0.5123, 0.4621, 0.3888, and 0.4550, respectively. On the other hand, the average variance extracted from the remaining four latent variables, namely assurance, empathy, utilization of new technology, and COVID-19 protocol are all greater than 0.5, and the composite reliability of all nine latent variables is more significant than 0.7.

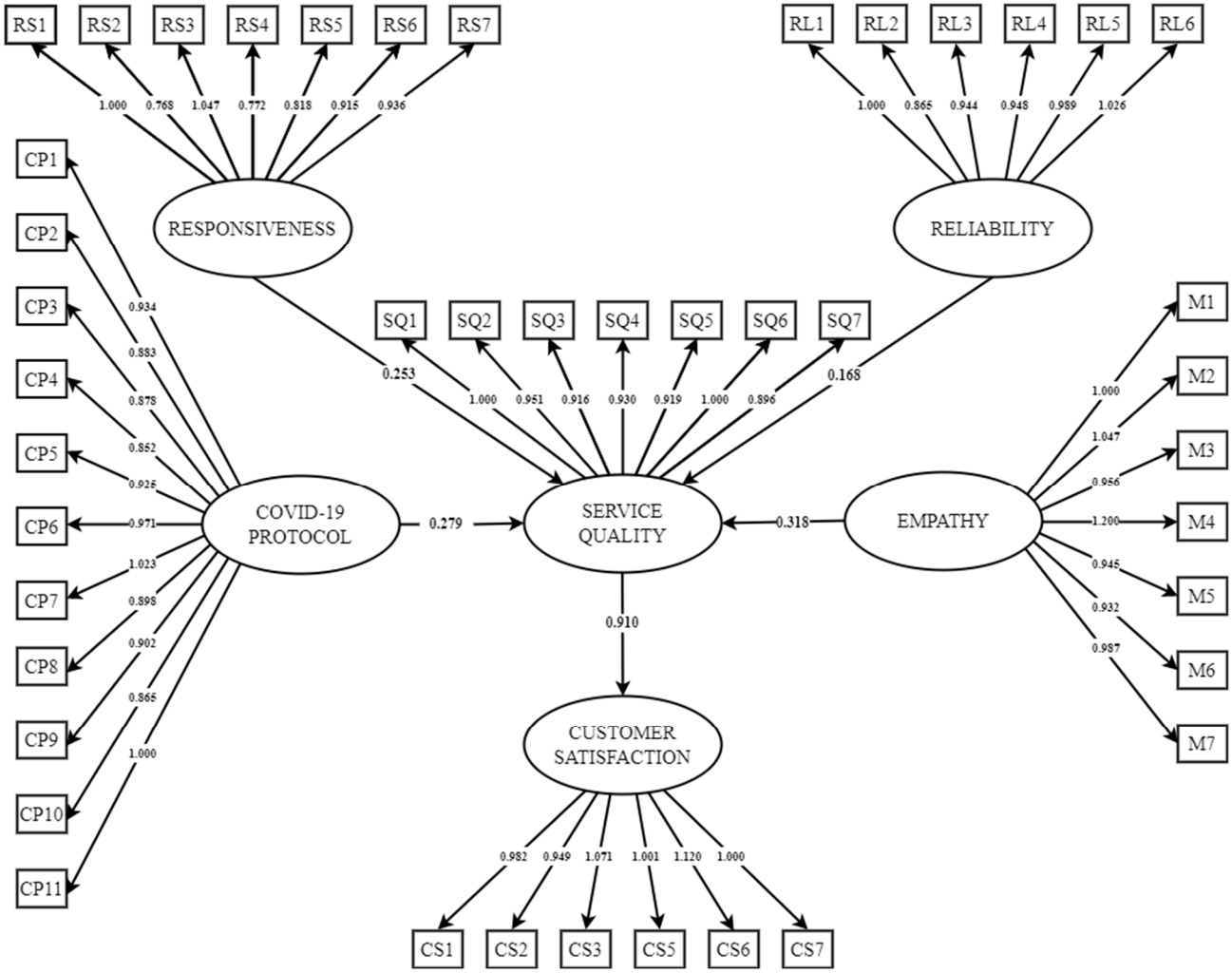

Figure 4. Final structural equation model.

Table 8. Validity of the model.

Factor	Cronbach's α	Average Variance Extracted (AVE)	Composite Reliability
Tangibility	0.859	0.4729	0.8622
Responsiveness	0.885	0.5123	0.8796
Reliability	0.837	0.4621	0.8372
Assurance	0.886	0.5243	0.8848
Empathy	0.896	0.5599	0.8988
Utilization of new technology	0.899	0.5929	0.8969
COVID-19 protocol	0.957	0.6701	0.9571
Service quality	0.924	0.3888	0.8154
Customer satisfaction	0.933	0.4550	0.8530

For structural equation models (SEM), Kline [41] suggests that, at a minimum, the following indices should be reported: the model RMSEA, the CFI, and the SRMR. The RMSEA value was 0.079, which is less than the recommended value according to Wang and Chiu [79] as shown in Table 9. The CFI value was 0.760, more significant than the suggested cutoff of 0.70, as per Chen et al. [80]. According to Maydeu-Olivares et al. [81], the SRMR value was 0.0402, less than the minimum cutoff.

Table 9. Model fit.

Goodness-of-Fit Measures of SEM	Parameter Estimates	Minimum Cutoff	Reference
Root Mean Square Error (RMSEA)	0.079	≤0.08	Wang and Chiu; adapted from Doloi et al., 2012 [68]
Comparative Fit Index (CFI)	0.760	>0.70	Chen et al., 2012 [69]
Standardized RMR	0.0402	<0.08	Maydeu-Olivares et al., 2018 [70]

Table 10 represents the causal relationship of the variables. The table presents that all ties have significant direct and total effects with *p* value less than 0.05, except the service quality to tangibility with a *p*-value of 0.096, service quality to assurance with a *p*-value of 0.798, service quality to the utilization of new technology with 0.123, customer satisfaction to tangibility with 0.101, and customer satisfaction to assurance and customer satisfaction to the utilization of new technology with 0.132. Moreover, all the relationships have significant indirect effects with a *p*-value of less than 0.05, except customer satisfaction to tangibility with a *p*-value of 0.101, customer satisfaction to assurance, and customer satisfaction to the utilization of new technology with 0.132.

Table 10. Direct, indirect, and total effects.

No.	Variable	Direct Effect	*p*-Value	Indirect Effect	*p*-Value	Total Effect	*p*-Value
1	SQ-T	−0.091	0.096	-	-	−0.091	0.096
2	SQ-RS	0.253	0.008	-	-	0.253	0.008
3	SQ-RL	0.168	0.036	-	-	0.168	0.036
4	SQ-M	0.318	0.002	-	-	0.318	0.002
5	SQ-A	0.041	0.798	-	-	0.041	0.798
6	SQ-UT	0.116	0.123	-	-	0.116	0.123
7	SQ-CP	0.279	0.001	-	-	0.279	0.001
8	SQ-CS	-	-	-	-	-	-
9	CS-T	-	-	−0.105	0.101	−0.105	0.101
10	CS-RS	-	-	0.333	0.009	0.333	0.009
11	CS-RL	-	-	0.2	0.037	0.2	0.037
12	CS-M	-	-	0.391	0.003	0.391	0.003
13	CS-A	-	-	0.048	0.805	0.048	0.805
14	CS-UT	-	-	0.141	0.132	0.141	0.132
15	CS-CP	-	-	0.49	0.001	0.49	0.001
16	CS-SQ	0.91	0.009	-	-	-	0.009

The hypotheses are summarized in Table 11. It demonstrates that tangibility has no significant relationship with service quality, with a *p*-value of 0.096, and assurance has no significant relationship with service quality, with a *p*-value of 0.0789. With a *p*-value of 0.123, utilization of new technology has no significant relationship with service quality. The other latent variables, on the other hand, show a significant relationship to service quality with a *p*-value less than 0.05. With a *p*-value of 0.009, service quality has a significant relationship with customer satisfaction.

Table 11. Summary of Hypotheses.

	Hypothesis	*p*-Value	Interpretation
H1	*There is a significant relationship between tangibility and service quality.*	0.096	Not-Significant
H2	*There is a significant relationship between responsiveness and service quality*	0.008	Significant
H3	*There is a significant relationship between reliability and service quality.*	0.036	Significant

Table 11. *Cont.*

	Hypothesis	*p*-Value	Interpretation
H4	*There is a significant relationship between assurance and service quality.*	0.798	Not Significant
H5	*There is a significant relationship between empathy and service quality.*	0.002	Significant
H6	*There is a significant relationship between COVID-19 protocol and service quality.*	0.001	Significant
H7	*There is a significant relationship between the utilization of new technology and service quality.*	0.123	Not Significant
H8	*There is a significant relationship between customer satisfaction and service quality*	0.009	Significant

5. Discussion

The study focused on assessing the system of the public utility bus in the province of Occidental Mindoro. AHP was used to rank the top five bus transits, and five criteria were also discovered: travel cost at 26.3%, travel time at 11.1%, waiting time at 4%, accessibility at 8.6%, and safety at 50%. This result is supported by a study in Vietnam [25], which showed that the safety of the passengers is one of the criteria when choosing a bus to ride on. This could also mean that passengers became more lenient in choosing bus transit during this pandemic. It means that bus transit providers must focus on ensuring the safety of the passengers by following the COVID-19 protocols. Bus transit ranking also demonstrates that bus transit 3 has the lowest ranking; to cope with bus transit 4, the provider must focus on improving the service and focus on the five criteria mentioned.

Using the SERVQUAL model, it was found that there is a massive gap between the expectations of the passengers and perceptions in the tangibility dimension. According to Khan and Fasih [82], tangibles can be felt or seen; they include current information and communication technologies, tools, location, firm employees, and any noticeable accommodations. Service providers, on the other hand, use these tangibles in a range of ways, and final consumers interpret and experience them on multiple levels. Tangibles are highly significant to service quality because they contribute to continuing to develop efficient, positive, and empowering consumer affiliations and experiences, which are acquired through specialized assets [83]. The researchers recommended that great attention be paid to all tangible aspects of service quality because such characteristics influence customer loyalty and can bring more profit to the company, especially to bus transit 3, which has the lowest ranking among the five [84].

SEM was utilized to analyze the correlations among tangibility (T), reliability (RL), responsiveness (RS), assurance (A), empathy (E), utilization of new technology (UT), COVID-19 protocol (CP), service quality (SQ), and customer satisfaction (CS). Based on the SEM results, the service quality directly affected the following: responsiveness ($p = 0.008$), reliability ($p = 0.036$), empathy ($p = 0.002$), and COVID-19 protocol ($p = 0.001$).

The results of the SEM mean that the bus providers must focus on responsiveness, reliability, empathy, and COVID-10 protocol because they directly affects service quality. The method by which service providers immediately respond to successfully resolve a customer's queries within a designated time frame is known as responsiveness. This service quality dimension is perceived through the individuals' portion of service quality. However, technological developments, such as emails, websites, and customer support interfaces, improve the responsiveness of service companies [85]. The reliability aspect of service quality pertains to how consistently service providers provide services to customers [82]. A service provider's ability to constantly offer such a quality of service is called reliability. Because the overall image left in a customer's mind after consuming a service is so essential, reliability has a robust effect on service quality [86]. According to Khan and Fasih [82], empathy is a service organization's capability to pay attention to particular client issues

that need addressing and then address these concerns successfully. Empathy is how a firm acknowledges responsibility for resolving problems encountered by its customers, either individually or collectively. Empathy is perceived as part of a service quality group [85]. COVID-19 practices have a direct effect on the performance of service quality [87]. During the COVID-19 pandemic, people's lifestyles changed, as have the services offered by many industries [42].

In addition, SEM revealed that customer satisfaction has an indirect and total effect on the following dimensions: responsiveness (p = 0.009), reliability (p = 0.037), empathy (p = 0.003), and COVID-19 protocol (p = 0.001). Lastly, service quality and customer satisfaction have a direct and total effect with a p-value of 0.009. According to Anthony [88], customer service is intimately connected to service quality and dimensions. Instead of being disappointed when they do not receive what they anticipate and perceive, consumers are more likely to be happy when they do.

Finally, Table 12 shows similar case studies with this research. The SERVQUAL model has been widely used in evaluating customer satisfaction in several areas, yet this paper's setting in a rural area, its parameters, and the addition of the MCDA technique (AHP) is the novelty of this manuscript.

Table 12. Summary of similar studies.

Title	Findings	Model Used	Parameters
Factors Affecting Customer Satisfaction in Fast Food Restaurant "Jollibee" during the COVID-19 Pandemic	Customer satisfaction was shown to be most significantly correlated with service quality, followed by cultural influence, food quality, COVID-19 protocols, and pricing. Additionally, it was observed that high levels of customer satisfaction at the Jollibee fast-food restaurant would be influenced by the establishment's cleanliness and appearance, sympathetic staff, food quality, price, and effective use of COVID-19 protocol prevention.	SERVQUAL	Assurance, Tangibility, Reliability, Responsiveness, Empathy, Service Quality, Culture/ Social Influence, Pricing, Customer Satisfaction, Food Quality, COVID-19 Protocol
Evaluating the Influence of Service Quality, Hedonic, and Utilitarian Value on Shopper's Behavioral Intentions in Urban Shopping Malls during the COVID-19 pandemic	Results revealed that during the COVID-19 epidemic, tangibles, empathy, and certainty had a substantial impact on shoppers' happiness with their shopping experience at malls.	SERVQUAL combined with Utilitarian and Hedonic Values and Behaviour Intention	Assurance, Tangible, Reliability, Responsiveness, Empathy, Utilitarian Value, Shopper Satisfaction, Hedonic Value and Behavioural Intention
Assessing Service Quality and Customer Satisfaction of Electric Utility Provider's Online Payment System during theCOVID-19 Pandemic: A Structural Modeling Approach	According to the findings, online payment security had the greatest positive impact on service quality, which in turn affected customer satisfaction. Additionally, service quality was positively impacted by tangibility, reliability, online payment options, and COVID-19 procedure. The service quality of the electric provider was negatively impacted by reliability, assurance, and empathy.	SERVQUAL	Assurance, Tangible, Reliability, Responsiveness, Empathy, Service Quality, Customer Satisfaction, Online Payment Security, COVID-19 Protocol

Table 12. *Cont.*

Title	Findings	Model Used	Parameters
Determining Factors Affecting Passenger Satisfaction of "Jeepney" in the Philippine Urban Areas: The Role of Service Quality in Sustainable Urban Transportation System	According to the findings, safety has the biggest impact on passenger satisfaction, followed by the driver's behaviour, value for money, adequacy of service, and informational materials	SERVQUAL	Passenger Expectations, Cleanliness and Comfort, Ambiance, Safety, Driver's Behavior, Service Adequacy, Route Efficiency, Information Materials, Value for Money, Passenger Satisfaction, Complaints, Future Intentions
Determining Factors Affecting Perceived Customer Satisfaction on Public Utility Bus System in Occidental Mindoro, Philippines: A Case Study on Service Quality Assessment during Major Disruptions	The results indicated that safety accounts for the most significant weight for bus passengers, while the service quality, responsiveness, reliability, empathy, and COVID-19 protocol significantly enhance service and customer satisfaction.	SERVQUAL combined with AHP	Assurance, Tangible, Reliability, Responsiveness, Empathy, Service Quality, Customer Satisfaction, Utilization of New Technology, COVID-19 Protocol

6. Conclusions

Using the Analytical Hierarchy Process, we found that safety accounts for the most significant weight for bus passengers. This is mainly because of the pandemic, and passengers have become more conscious of the environment. The SERVQUAL approach was also used to address the gap between the expectations and perceptions of the passengers. Using SERVQUAL survey questionnaires, the participants' expectations and perceptions about bus transits were identified. The gaps calculated are as follows: tangibility, responsiveness, reliability, assurance, empathy, utilization of new technology, COVID-19 protocol, service quality, and customer satisfaction. The SERVQUAL dimensions are also utilized as latent variables to determine the factors affecting customer satisfaction. It was discovered that service quality, responsiveness, reliability, empathy, and COVID-19 protocol have the most significant impact on enhancing service and customer satisfaction. It can also help determine the significant and insignificant factors in enhancing the service quality and improving the customer satisfaction of bus providers worldwide during the pandemic.

Theoretical Contributions

A total of 200 participants answered the questionnaire, which was created from related studies. The relationships among the nine latent variables were analysed using SEM. The variables were tangibility, responsiveness, reliability, assurance, empathy, utilization of new technology, COVID-19 protocol, service quality, and customer satisfaction. The result of the analysis revealed that the variables service quality, responsiveness, reliability, empathy, and COVID-19 protocol are the significant factors that affect customer satisfaction. As an extension, AHP found that safety is the most important criterion for passengers when choosing a bus provider. The findings of this research study can now serve as a service quality assessment of public utility buses and can also be used by government agencies to be a basis for planning a sustainable public bus transportation system, especially in rural areas. Finally, this model can also be used when there is no longer a pandemic and restrictions have been lifted by removing the COVID-19 protocol as a latent variable in the framework.

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