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Commuters' satisfaction with service quality of Airlift and Swvl bus services in Lahore

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Abstract

The Airlift and Swvl App-based demand-responsive bus services were initiated in Lahore to fill the demand of available travelers. These services provide travel options at designated routes and stops. The commuters can book their ride using mobile applications mentioning their pick-up and drop-off locations on a particular route. Commuters' satisfaction with service quality is important to make these services successful in the long run. Therefore, this study aims to evaluate the commuters' satisfaction with the quality of service of both bus services using the results of a questionnaire survey. The questionnaire was designed consisting of personal and travel information of the respondents, and perceptions related to satisfaction with selected attributes of service quality. This survey was conducted in Lahore city, and 200 and 284 samples were obtained for Airlift and Swvl bus services, respectively. Factor analyses were conducted on collected data and the structural model of users' satisfaction was constructed. The factors of Airlift bus service included service and system attributes (SSA), instrumental attributes (IA), safety and attractive attributes (SAA) and spatial and temporal coverage attributes (SCTA) and of Swvl bus service included spatial coverage and safety attributes (SCSA), instrumental attributes (IA), system Attributes (SA) and attractive attributes (AA). The results of structural equation modeling revealed that the service, system, instrumental, safety, and attractive attributes, and spatial and temporal dimensions are significant determinants of commuters' satisfaction with the service quality of transit modes. The users' overall satisfaction with service quality also has a positive influence on commuters' intentions to continue the use of these services. The improvements in specific attributes would enhance commuters' satisfaction as well as their intentions to use Airlift and Swvl bus services.

Keywords: Satisfaction, Service quality, Travel behavior, Questionnaire survey, SEM

1. Introduction

Transport demand is on the rise in the developing countries, whereas the supply is unable to meet the increasing requirements because of uncontrolled population growth [1]. When it comes to meeting with public transport needs, the public sector services do not offer adequate facilities and this gap creates space for other alternative transport services such as DRT services. DRT services dynamically allow the service operators to adjust supply and demand by allowing travelers to request the preferred transit services through the use of smart-phone applications [2]. In the last decade, DRT services have gained immense popularity for reasons such as flexible demand problems with traditional bus systems, high fares of the conventional taxi, scheduling and routing issues with other transit services, and their spatial coverage in terms of community transport [3]. Historically, DRT evolved from door-to-door dial-a-ride services (sometimes referred to as Special Transport Services – STSs) [4]. The DRT services allow passengers to meet their demand through a calling service using a Smartphone application and they can also get real-time information about the driver and trip characteristics. Passenger can view the real-time location of vehicles and estimated arrival time once the request is made. The payments are sometimes automatically charged to the passengers' credit card or passengers must pay in cash [2].

In the city of Lahore, transit demands have increased at an accelerated pace and the city has been accommodating more than eleven million inhabitants [5]. Though the government has been endeavoring to meet travel demand through various public transport initiatives, still there is a big gap between the transport demand and supply. Until recently in the absence of regular taxi service, rickshaw had gained immense acceptance among the masses in Lahore and it was treated as the "taxi of the city"[5]. However, riding through the rickshaw is not comfortable and safe as reported by Tahir et al [6]. Considering the increase in travel demand, a few private bus companies (i.e. Airlift and Swvl, etc.) have started app-based bus services to meet the travel needs of the residents in the city. Airlift and SWVL started their services in March of 2019 and July of 2019, respectively [7, 8]. The main aim of the service providers was to provide affordable, reliable, comfortable, safe, and secure transport services to the residents of the second largest city of Pakistan. Since considerable time has passed and app-based bus services reportedly have become popular among the residents, it is pertinent to investigate the satisfaction level of the passengers and identify the key factors affecting passenger's perception of the quality of service of these DRT public bus services.

The study was carried out to determine commuters' satisfaction with app-based DRT services in Lahore. A questionnaire-based approach is one of the commonly used

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techniques to evaluate the satisfaction of the commuters towards a service [9]. Therefore, a questionnaire survey was designed and conducted to collect the requisite information from the users about these DRT services in Lahore. Exploratory Factor Analysis (EFA) was run on SPSS 18.0.2 to determine the underlying factors influencing commuters' satisfaction levels and Structural Equation Modeling (SEM) was used to explore the significant determinants of commuters' satisfaction with the service quality of app-based DRT bus services.

The remaining part of the paper is organized in the following manner: Section 2 describes the relevant literature studies about passengers' satisfaction behavior towards public transport services; section 3 discusses the survey design, data collection, and analysis methods; section 4 explains the analyses of results acquired through EFA and SEM. Finally, conclusions and recommendations are drawn for the improvement of these services. Future research directions are also hinted out for the continuation of this research study.

2. Literature review

Commuter's satisfaction is a very crucial parameter with enormous significance for the evaluation of the sustainability of public transport services. Redman et al. [10] referred to commuter satisfaction as a sort of evaluation, done in a viable manner considering the needs and expectations of the users. The service quality can be estimated by the passenger's expectations and perceptions regarding a particular service offered [11]. Many of the research studies have been conducted to determine the commuter's satisfaction in the field of public transportation. Service quality is proved to be a sure determinant of passenger loyalty [9]. According to research by Borhan et al. [12], attitudes and behaviors of the users are very much dependent and subject to the quality of public transport offered, and both are connected in a positive relation. The provision of improved public transport services leads to higher commuter satisfaction [13].

A study carried out in Norway concluded that safety, station location, quality of vehicles, traveling time, availability, information, ticket systems, price level are the key factors affecting passenger's perception about the quality of public transport service [14]. Githui et al. [1] identified three underlying factors affecting passenger's choice of public transport. These three underlying factors were identified as travel time, commuters' safety, and travel cost. de Ona et al. [15] found vehicle environment and comfort were the main priorities of passengers while using bus service in Granada, Spain. Eboli and Mazzulla [16] concluded that service planning and reliability, comfort, and network design are important determinants of commuters' satisfaction with public transport in Cosenza, Italy. Another study by Redman et al. [10] concluded that service reliability and frequency are the most important attributes in attracting car users to use public transportation. A study conducted in two major cities of Greece on public satisfaction about five transit systems concluded that service frequency, waiting time, accessibility, and vehicle cleanliness were important factors of concern for public transport users [17]. Karlaftis et al. [18] argued that overall service, comfort, and bus environment are important latent variables. A study conducted by Fellesson and Friman [19] in nine European cities regarding commuters' perceived satisfaction with public transport services found that substantial aspects contributing to passengers' satisfaction are service reliability, bus stop design, service information, frequency, staff skills, timetable adequacy, and safety. A study carried out by Lau and Chiu [20] defined accessibility and mobility as the important factor of commuter's satisfaction in the usage of public transport in Hong Kong. The findings of a commuter satisfaction study by Grujicic et al. in Belgrade, Serbia revealed waiting time, cleanliness, and comfort as more important variables [21]. Grujicic et al. [21] highlighted travel time, economy, environmental impact, reliability, safety, accessibility, and comfort as significant parameters of passengers' satisfaction. A study conducted in Taiwan conducted by Chen [22] manifested that service attributes including vehicle safety, facility cleanliness, and complaint handling are important aspects with a profound impact on the behavioral intentions of travelers.

Disney [23] endorsed that by understanding commuter demands through effective communication such as polite behavior and positive attitude of bus drivers, user's satisfaction can be improved manifold. Edvarson [24] believes that the use of information on commuters' wishes and expectations and the interaction of drivers with passengers are the main parameters of passengers' satisfaction. Another study by Bielen and Demoulin [25] investigated that waiting time plays an important role in overall commuters' satisfaction with public transport. Noor et al. [26] argued that for minibus users, factors like comfort and convenience are of utmost importance. The findings of a study carried out by Javid et al. [27] showed that time, cost, and symbolic information are important dimensions for the users of the Daewoo bus service in Lahore. A summary of different research studies conducted around in various countries that reported different underlying factors affecting public bus users' behaviors are highlighted in Table 1.

Table 1 Summary of factors influencing the user's satisfaction with public transport service

Authors	Country	Service type	Identified factors
Stuart et al. (2000) [28]	USA	Subway system	Safety, courtesy, cleanliness, frequency, and predictability
Manuel et al. (2007) [29]	Spain	Conventional public bus system	Reliability, responsiveness, assurance, and empathy
Tyrinopoulos and Antoniou (2008) [17]	Greece	A traditional public bus transport system	Service frequency, waiting time, accessibility, and vehicle cleanliness
Kamaruddin et al. (2012) [3]	Malaysia	A traditional bus transport	Safety, accessibility, reliability, fare, communication, and trip experience
Shaaban and Khalil (2013) [30]	Qatar	Bus transport system	Affordability and cleanliness
Murambi and Bwisa (2014) [31]	Kenya	Shuttle transport system	Travel time, punctuality, availability of information, good staff behavior, frequency of route change and security
Nwachukwu (2014) [32]	Nigeria	Public bus transport	Comfort, accessibility, bus stop facilities, and bus capacity adequacy
Ona et al (2013) [15]	Spain	Traditional public bus transport system	Fare, information, safety, accessibility, cleanliness, temperature, proximity, speed, punctuality, and frequency
Şimşekoglu et al (2015) [33]	Norway	A conventional urban bus transport system	Flexibility, convenience, and safety
Ponrahono et al. (2016) [34]	Malaysia	Conventional urban and rural bus services	Travel time, waiting time, the regularity of service, service reliability, comfort, cleanliness and crew behavior
Mahmoud and Hine (2016) [35]	United Kingdom	A traditional public bus transport system	Comfort, stop location, park and ride availability, waiting time, reliability, frequency, information, fare and safety
Javid et al., (2015) [36]	Pakistan	Metro bus transport system	Reliability, friendliness, and instrumental dimensions

The literature mentioned above highlighted that service reliability, convenience, safety, frequency, fare, accessibility, and waiting time are important attributes of commuter's satisfaction with public transport service. Each of the reported studies referred to different attributes which are pertinent to the socio-economic features of the respondents and specific to each region. However, service frequency, reliability, comfort, safety, travel speed, cleanliness, and behavior of drivers are some of the common attributes of commuters' satisfaction in many studies [3, 15, 17, 34. Furthermore, the majority of the studies mentioned above focused on traditional bus service systems, with little focus on DRT public bus services in the developing countries. According to the best knowledge of the authors, no study has been conducted so far which investigated the satisfaction behavior of commuters towards app-based DRT public bus services in Lahore, Pakistan. This research study fills the gap in the existing body of the literature. The findings of this research study are aimed at identifying the underlying factors and attributes of DRT public bus transport services which influence commuter's satisfaction in Lahore, Pakistan. Based on the findings, some policy recommendations will be proposed to improve the service quality of the existing transit services. This research study can provide guidelines for the operating companies and transport planners for the design of appropriate policies to attract new passengers and retaining the existing passengers.

3. Data collection and analysis methods

This section presents the discussion on data collection and analysis methods.

3.1 Questionnaire design

An objective-oriented questionnaire was designed consisting of three parts. The first part of the questionnaire included personal information of the respondents e.g. age, gender, income, vehicle ownership, profession, etc. The second part consisted of questions related to travel characteristics of the respondents e.g., travel mode, trip frequency, etc. In the third part, several attributes of service quality of Airlift and Swvl bus service were selected and evaluated using a five-point Likert scale e.g., totally unsatisfied (1), unsatisfied (2), neutral (3), satisfied (4), and totally satisfied (5). The selected attributes included service reliability, speed, access for disabled people, complaint handling, fare collection system, affordability, cleanliness, environmental impacts, information system, travel time saving, comfort, attractiveness, safety, security, privacy concerns, route alignment, service schedule, accessibility, the behavior of drivers, and location of bus stops, etc. These attributes were selected considering the potential and nature of these services from the users' perspectives.

3.2 Survey and sampling

This survey was conducted at selected locations along the routes of Airlift and Swvl bus services. It was conducted with the help of university students who were trained for the survey. The survey team members interviewed the targeted respondents either at the bus stops or on the bus during traveling. The random and purpose-based sampling techniques were adopted in the selection of respondents. All interviews were conducted carefully to ensure the reliability of the collected data. At the start, the respondents were instructed regarding the contents and objectives of the survey. The survey items were presented schematically so that they should be understood easily by the general public. The sample size was determined considering minimum requirements of sample size for use in the structural equation (SEM) modeling. Researchers have made suggestions related to sample size requirements such as (1) a minimum sample size of 200 is required to reduce the biases to an acceptable level [37, 38], (2) a ratio of 10 observations per indicator [39] and as low as 5 cases or observations per indicator are sufficient when latent variables have multiple indicators [40], (3) the minimum sample size should be at least ten times the number of free parameters [41, 42]. Considering these recommendations, it was hypothesized that sample sizes of 200 or more are sufficient for use in the SEM.

3.3 Modeling of collected data

The collected data were analyzed using structural equation modeling (SEM) methods. This is a multivariate statistical analysis technique. Exploratory factor analysis was run first to extract the suitable factors on service quality attributes of Airlift and Swvl bus services. These analyses were conducted using the maximum likelihood method in combination with Varimax rotation. The rotation of factors was done to obtain interpretable and logical factors. The SEM approach was used as it allows us to include many observed and latent variables or factors in the model. A latent variable or a combination of latent variables represents a measurement model or equations. This measurement model shows the correlations between observed variables and the extracted factors or unobserved variables. In the factor analysis mathematical model, p denotes the number of observed variables ($X_1, X_2, X_3, \ldots\ldots, XP$) in the factor analysis and m shows the number of underlying factors ($F_1, F_2, \ldots\ldots, F_m$). Let X_j is the observed variable represented in the possible latent variable or factors. The mathematical equation (1) assumes that there are m underlying factors and each observed variable is a linear function of these factors together with a residual error (e_j) as follows [43].

$$X_j = a_{j1}F_1 + a_{j2}F_2 + \cdots + a_{jm}F_m + e_j \quad (1)$$

Where $j = 1, 2, 3, \ldots, p$.

The factor loadings are $a_{j1}, a_{j2}, \ldots, a_{jm}$ which represents that a_{j1} is the factor loading of *the* j^{th} variable on the first factor (F_1). The factor loading indicates that how much the variable has contributed to a particular factor; a variable with higher factor loading means it has more contribution to that factor. A structure of users' satisfaction and intentions to use bus service was constructed using results of factor analysis separately for Airlift and Swvl bus service. The reliability of the model was tested comparing values of the goodness of fit parameters with their permissible values. The goodness of fit parameters included the ratio of chi-square to the degree of freedom (chi-sq/DF), comparative fit index (CFI), the goodness of fit index (GFI), adjusted goodness of fit index (AGFI), and root mean square error adjusted (RMSEA). The recommended values of selected parameters are: the chi-sq/DF should be between 2-5, GFI, AGFI, and CFI are required to be more than 0.9 and RMSEA should be less than 0.08 [44-47].

4. Results and discussion

4.1 Description of sample

Table 2 shows the distribution of the sample for Airlift and Swvl bus service. The collected samples for Airlift and Swvl bus services were 200 and 284, respectively. Male respondents account for 73% for Airlift and 79.9% for the Swvl bus service. The share of middle-income respondents is higher in both samples. Most of the respondents belong to the young age group and student profession. Around 66.5% of the respondents own motorcycle in Airlift sample whereas this share is 79.6% in the Swvl bus sample. Similarly, the number of respondents who own a car in Airlift and Swvl sample is 40.5% and 48%, respectively.

Around 70% of the respondents in both samples have a trip frequency between 4-7 days a week. Education and work are the main purposes of traveling by Airlift and Swvl bus services. Around 80% of the respondents showed a willingness to use

Table 2 Descriptive statistics of the sample

Characteristics		Airlift	Swvl
Sample size, N		200	284
Gender	Male	73 %	79.9 %
	Female	27	20.1 %
Income (PKR)	< 30,000	17 %	12.7 %
	30,000 – 60,000	51.5 %	58.1 %
	>60, 000	31.5 %	29.9 %
Age (years)	Under 30	79 %	78 %
	Above 30	21 %	22 %
Profession	Student	61 %	63.4 %
	Employees	38.5 %	35.2 %
	Others	0.5 %	1.4 %
Motorcycle ownership	Yes	66.5 %	79.6 %
	No	33.5 %	20.4 %
Car ownership	Yes	40.5 %	48 %
	No	59.5 %	52 %
Driving license	Yes	36.5 %	42.3 %
	No	63.5 %	57.7 %
Travel frequency	1-3 days a week	31.5 %	29.2 %
	4-7 days a week	68.5 %	70.8 %
Trip purpose	Work	39.5 %	33.1 %
	Education	57 %	60.6 %
	Others	3.5 %	6.3 %
Intention to use bus service	Yes	80 %	76 %
	No	20 %	24

Table 3 Rotated factor loadings for attributes of Airlift bus service

Observed variables	Mean	SD	Factors			
			SSA	IA	SAA	STCA
Complaint handling	3.930	0.954	0.741			
Equity (for disabled people)	3.850	0.996	0.686			
Fare collection system	4.010	0.992	0.619			
Travel time saving	3.945	0.970	0.600			
Information system	3.890	0.878	0.553			
Affordability	3.894	1.089		0.835		
Cleanliness	4.080	0.953		0.641		
Environmental impacts	3.900	0.919		0.624		
Behavior of drivers	3.950	0.939		0.592		
Comfort	3.940	0.962		0.590		
Service reliability	3.967	0.802		0.575		
Attractiveness	3.955	0.909			0.702	
Safety	4.045	0.881			0.683	
Privacy concerns	4.030	0.935			0.680	
Security	4.060	0.895			0.590	
Route alignment or coverage	3.848	0.970				0.773
Service schedule	3.860	0.951				0.715
Pick up / drop off location	3.865	0.975				0.612
Accessibility	3.910	1.052				0.513
% of variance explained			18.707	17.737	17.197	11.695
Cronbach's Alpha (α)			0.785	0.653	0.583	0.521

Airlift bus service whereas this willingness for Swvl bus service is 76%.

4.2 Exploratory factor analysis (EFA)

Two EFA analyses were conducted on respondents' responses related to service quality attributes of Airlift and Swvl bus services. A cut-of-point value of 0.5 was used for the extraction of factors. Values of 0.4 or even 0.3 are acceptable for the extraction of factors; however, a higher value shows more reliability of factors and internal consistency among respondents in the evaluation of the observed variables.

4.2.1 Rotated factor loadings for Airlift bus service

An exploratory factor analysis (EFA) was conducted on respondents' perceptions of service quality attributes of Airlift bus service. This factor analysis resulted in four factors (latent variables) as presented in Table 3. These factors were named taking into account the nature of their observed variables and referring the literature [1, 19, 27]. These factors are (1) Service and System Attributes (SSA), (2) Instrumental attributes (IA), (3) Safety and Attractive Attributes (SAA), and (4) Spatial and Temporal Coverage Attributes (SCTA). The % of variance explained by four factors is 18.707, 17.737, 17.197, and 11.695, respectively. The cumulative % variance explained by all four factors of the total variance is 65.336% which is in agreement of the recommended values [48-51]. The estimated values of Cronbach's Alpha are above 0.5 which shows moderate level of reliability of the extracted factors and internal consistency among respondents in evaluation [52-54]. The first factor of SSA consists of observed variables on supporting system and service facilities of Airlift bus service such as information provision and complaints system, fare system, and services for disabled people. These system and service attributes are important in improving commuter's satisfaction with service quality as these attributes help them to be aware of different aspects of service including fare structure and handling of complaints related to provided service. The SSA factor shows that the commuters who have positive satisfaction with these attributes of service quality would

Table 4 Rotated factor loadings for attributes of Swvl bus service

Observed variables	Mean	SD	Factors			
			SCSA	IA	SA	AA
Route coverage	3.979	0.793	0.661			
Pick-up/drop off location	4.026	0.861	0.644			
Service Reliability	4.061	0.807	0.613			
Security	3.968	0.899	0.591			
Safety	4.197	0.796	0.588			
Accessibility	3.835	1.018	0.556			
Affordability	4.183	0.879		0.843		
Comfort	4.067	0.895		0.687		
Cleanliness	4.151	0.846		0.628		
Behavior of drivers	3.986	0.855		0.586		
Environmental Impacts	4.109	0.823		0.505		
Incentive system	3.898	0.819			0.709	
Fare collection system	3.844	0.879			0.664	
Service schedule	3.919	0.897			0.637	
Speed	4.074	0.802				0.720
Attractiveness	4.021	0.893				0.631
Privacy Concerns	4.050	0.855				0.605
Travel time saving	4.056	0.851				0.511
% of variance explained			25.585	18.400	16.334	15.782
Cronbach's Alpha (α)			0.810	0.764	0.635	0.570

Note: SCSA: spatial coverage and safety attributes, IA: instrumental attributes, SA: system attributes, and AA: attractive attributes

have high intentions to use Airlift in the future. The second factor of IA included observed variables concerning travel cost, vehicle hygiene, comfort, service reliability, the social behavior of drivers, and the environmental impacts of Airlift bus service. The perceived travel cost of service, driver's attitudes, travel time and schedule reliability, vehicle cleanliness, comfort in terms of temperature control, and environmentally friendly nature are important attributes of service quality that would help in making this service attractive and friendly for the users. The travelers' having a strong belief in instrumental dimensions of service quality would prefer to use this service if it provides the required level of satisfaction. The SAA factor shows that the safety and security during traveling and at the bus stop, service attractiveness and individual's privacy concerns are important attributes of users' satisfaction with the service quality. The commuters who are more satisfied with SAA variables would have more preferences to use Airlift service. The fourth factor of SCTA depicts that the spatial coverage in terms of routes and stops locations, easiness in accessing the service, and service schedule are significant service quality dimensions that may influence the users' satisfaction. An increase in the number of routes and bus stops (pick-up/drop-off locations) and convenient schedules would help in improving the commuter's satisfaction and potential to use Airlift bus service.

4.2.2 Rotated factor loadings for Swvl bus service

Another EFA was conducted on responses on service quality attributes of the Swvl bus service. This analysis resulted in four factors as shown in Table 4 and named considering the nature of their observed variables [1, 19, 26, 27, 36]. These factors are (1) Spatial Coverage and Safety Attributes (SCSA), (2) Instrumental Attributes (IA), (3) System Attributes (SA), and (4) Attractive Attributes (AA). The % of variance explained by four factors is 25.585%, 18.40%, 16.334% and 15.782%, respectively. The cumulative % variance explained by these factors is 76.04% which is more than the suggested values [48-51]. The estimated Cronbach's alpha values of all four factors are more than 0.5 which shows a moderate level of reliability of extracted factors and internal consistency among respondents in the evaluation [52-54]. The first factor of SCSA included observed variables related to the spatial coverage of Swvl bus service in relevance to routes, bus stop location, and accessibility convenience as well as safety and security dimensions of the service quality. The respondents showed positive satisfaction with most of these attributes and improvements in spatial coverage in terms of increasing the number of routes and pick-up and drop-off locations would help in easing the access to the service. The results of the IA factor show that the respondents' satisfaction is high with attributes of comfort, service affordability, vehicle hygiene condition, drivers' behavior, and environmental consideration of this service. Proper and affordable fare structure, drivers' attitudes, vehicle cleanliness, comfort in terms of temperature control, and environmentally friendly nature are important attributes of commuter's satisfaction with the service quality that need attention from the service providers.

The third factor of SA consisted of observed variables on the provision of relevant information to the users, incentive schemes, schedule information, and fare collection system. These results show that the users' positive evaluation of these attributes would help in improving their satisfaction with the service and potential to use it in the future. The service providers should consider developing an efficient system for providing timely information to the users on available bus routes, schedules, available incentive schemes, and fare structure. The factor of AA shows that the users' satisfaction with such attributes of service quality can be handy in improving the use of bus service. Travel time saving with proper speed control can help in making Swvl service attractive for existing and potential users. The Swvl bus service quality should address the privacy issues of passengers especially females as it will help in improving their confidence and satisfaction in using it.

4.3 Development of structural models of commuters' satisfaction

Using the results of factor analysis, two structural models were developed. It was hypothesized that the respondents' overall satisfaction with Airlift and Swvl bus service was influenced by their satisfaction with factors of service quality attributes. It was assumed that the commuters' intentions to use these services were influenced by their overall satisfaction with service quality. Also, the extracted factors of service quality attributes have indirect influence through overall satisfaction and may have a direct influence on commuters' intentions to use Airlift and Swvl bus services.

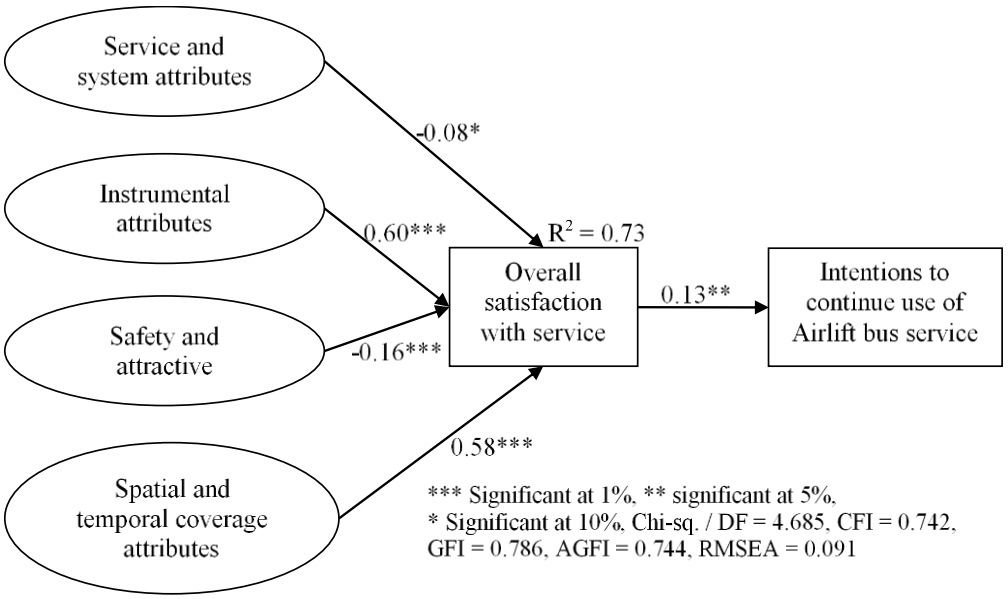

Figure 1 Structure of users' satisfaction with Airlift bus service

4.3.1 Structural model of Airlift bus service

A structural model was developed using the results of exploratory factor analysis. Figure 1 presents a structure of commuters' satisfaction with the Airlift bus service. The structural relationship between the factor of service and system attributes and overall satisfaction with service is negative and significant at 10% level of significance. It shows that commuters are satisfied with service and system-oriented improvements and any improvement in these attributes will not affect their overall satisfaction with the service quality of the Airlift bus service. The structural correlations of instrumental attributes, and spatial and temporal coverage attributes are significant and positive with overall satisfaction, which depicts that any improvement in such dimensions of service quality would help in improving users' satisfaction and intentions to use bus services. These improvements may include better vehicle cleanliness, educated drivers, fare adjustment as per riders' affordability, and more routes and stop locations. Other studies have also reported that the instrumental dimensions are important service quality attributes that influence the users' intentions [10, 36]. The addition of routes and stops would help in addressing issues of accessibility and convenience in using Airlift bus service. The structural relationship of safety and attractive attributes factor is negative, which shows that the commuters have an acceptable level of satisfaction with safety, security, attractiveness, and private oriented dimensions of service quality. All these four factors also have a significant indirect effect on commuters' intentions to continue use of Airlift bus service in the future. It is well known that the safety and security dimensions are highly important attributes of service quality that affect commuters' satisfaction and intentions to use a transit service [1, 10]. The significant and positive relationship between overall satisfaction variable and variable of 'intentions to continue the use of bus service' implies that the more is the satisfaction with service quality, the more people will use this service. The users' intentions to use a particular transit mode are highly influenced by how they perceive the service quality of that mode [19, 21, 22]. The value of the ratio of Chi-sq/DF is below 5 and values of CFI, GFI and AGFI are more than 0.7 and value of RMSEA is near to 0.08 which show that this structural model has an acceptable level of reliability in predicting the commuters' satisfaction and intentions with the service quality of Airlift bus service.

4.3.2 Structural model of Swvl bus service

A structural model of commuters' satisfaction and intentions with the Swvl bus service is presented in Figure 2. This model shows that the structural relationships between extracted factors on service quality attributes with overall satisfaction are significant and positive. The positive coefficients depict that the improvements in these attributes would enhance users' satisfaction with the service quality of the Swvl bus service. The improvements may include better security and safety at stops and in the bus, more routes and stops locations to improve accessibility, service reliability, provision of proper information on routes and stops, improvements in fare structure, skilled and educated drivers, vehicle cleanliness, and comfortable service. Improvements in the mentioned service quality attributes are vital for better satisfaction of users with service quality [1, 27, 28].The users' overall satisfaction is positively associated with their intentions to continue the use of bus service. It means that improvements in service quality would improve users' satisfaction as well as intentions to use this service [19, 21, 22]. The indices of the goodness of fit parameters show that this model has a certain level of reliability in predicting the users' satisfaction with service quality.

4.4 Implications

A comparison of both structural models of Figure 1 and Figure 2 shows that the overall satisfaction of users has a strong association with their intentions to continue the use of service. In the Swvl structural model, all four factors have a positive association with overall satisfaction, whereas in the Airlift model, the service, system, safety, and attractive attributes formed a negative association with overall satisfaction. This comparison implies that users' satisfaction can be improved by making improvements in all service quality attributes of Swvl bus service, whereas in specific attributes of Airlift bus service as mentioned earlier. The extracted factors provide a good understanding of the users' satisfaction with service quality and give direction to make necessary improvements. Expansion of routes coverage and service schedule are important measures in enhancing the satisfaction of current users as well as attracting potential users. There is a need to develop an efficient and reliable online system to provide necessary and timely information to the users on bus routes, stops, and schedules. The integration of information system technologies can be helpful in

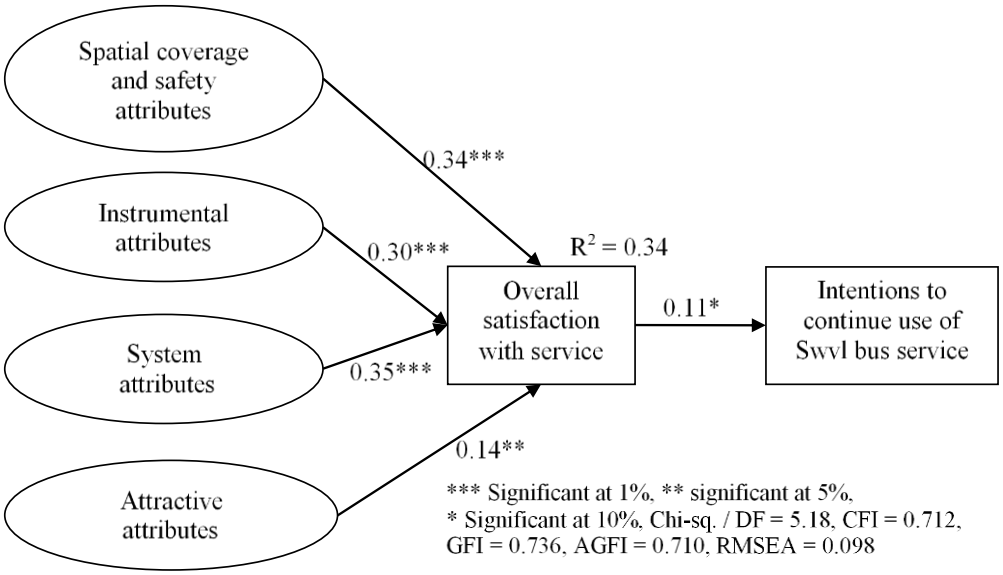

Figure 2 Structure of users' satisfaction with Swvl bus service

this regard. The better satisfaction of users with service quality helps in developing positive attitudes and intentions towards transit modes [33, 35]. Moreover, vehicle cleanliness, drivers' behavior, and ensured safety and security of passengers can be handy in improving users' satisfaction and keeping them with the services [16, 21].

5. Conclusions

This study investigated users' satisfaction and intentions with Airlift and Swvl bus services in Lahore city. Exploratory factor analysis resulted in significant factors of service quality concerning to commuters' satisfaction. The factors of bus system information, service attributes, spatial and temporal coverage of services, service attractiveness, safety, and security dimensions, and instrumental attributes are significant service quality attributes of users' satisfaction with Airlift and Swvl bus services in the context of Lahore city. The overall satisfaction variable has shown a good association with respondents' intentions to continue the use of bus services. These factors of satisfaction also have significant influence through overall satisfaction as a mediating variable on commuters' intentions to use bus services in the future. The modeling results implicate that the improvement in service quality dimensions of both services would enhance the users' satisfaction. The more is the users' satisfaction, the more they will prefer to use the bus services. The improvements in spatial and temporal coverage, safety and security attributes, fare structure, and information system would help to develop positive attitudes and intentions of users towards these services. The findings of this study would help service providers to make necessary improvements as per the perceptions of the users. These findings are based on a specific and small sample size, and most of the respondents are students and belong to a young age group. Therefore, the extracted results have some limitations in generalizing their implications. Future studies should focus on a large sample comprising of respondents from different age, and income groups. This will help in making comparisons among different groups.

6. References

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