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EVALUATION OF USER'S PERCEPTIONS REGARDING PERFORMANCE INDICATORS OF INTERCITY BUS TERMINALS IN LAHORE, PAKISTAN

Summary. This study aims to evaluate the intercity bus terminals in metropolitan Lahore, Pakistan. In this regard eleven intercity bus terminals of Lahore (three government-owned & eight privately owned) were selected. Evaluation of performance indicators (PIs) for a sustainable design of intercity bus terminals was conducted with the help of different surveys. Six PIs on user perception were evaluated, i.e., safety and security, access, information, connection and reliability, environment and allied facilities. The bus terminals and PIs were also ranked according to user satisfaction. The results showed that the privately owned intercity bus terminals perform better and are more likely to be sustainable as compared with government-owned terminals. Likewise, the users indicated more satisfaction with the privately owned terminals. In addition, the users rated 'safety and security' as the most important among the six PIs. It is recommended to establish standards for sustainable design of intercity bus terminals using the six PIs as measures of performance.

1. INTRODUCTION

Punjab is the largest province of Pakistan and it consists of 37 districts (The Urban Unit, 2007). More than one third of Punjab's population lives in urban areas at present. There are five mega cities in the province of Punjab. The existing infrastructure including the public transportation system has failed to fulfill the transportation needs of urban areas. The pace of development of public transport infrastructure did not cater to the demands of a growing population. Moreover, improper planning and poor designing of intercity transport infrastructure has led to the failure of the existing system. As a result, the present condition of the intercity bus terminals is causing extreme hardship and stress to the people, which significantly affects social and economic well-being. Poor management and operation and no consideration for pedestrian movement and disabled people makes the intercity bus terminals unsuccessful. In addition, the population of Lahore district has been rising rapidly, by 7.5 times since the first census conducted in 1951. The fastest growth pace was noted between 1972 and 1981, i.e., 4.3% annually (JICA, 2012). Rapid growth and increased mobility in metropolitan cities of developing countries contribute towards more congestion, pollution and environmental degradation.

After approaching different relevant departments, i.e., the Transport Department, Government of Punjab, Traffic Engineering and Transport Planning Agency, TEPA, and The Urban Unit and

Transport Planning Unit, and collecting available related material, it was found that there are no planning and design documents available, which may help in designing intercity bus terminals. In the context of Pakistan, intercity bus terminals are defined as “Bus Stands”. Bus stands are categorized into four classes i.e. A, B, C and D class on the basis of area and administration authority only (Motor Vehicle Rules, 1969). This is a very outdated way to classify the intercity bus terminals. The general practice is to study the international standards and then adopt them as it is, while ignoring the socio-economic characteristics of the country.

Most of the previous studies focus on demand, operational and performance characteristics of the intercity public transport service (Woldeamanuel, 2012, Fravel and Barboza, 2012, Arintono, 2010, Freitas, 2013). There is still a need for academic studies that should focus on evaluation of performance indicators of intercity public transport terminals because it will provide some key policy implications to transport planners. Therefore, in order to cater to the growing demands of intercity public transport and mitigate various problems arising from lack of sustainable intercity bus terminals, and to facilitate the users, there is a need for innovations in the planning and design of intercity bus terminals. In this regard, this research includes the assessment of the user’s problems and needs. With the help of survey results, this research develops general guidelines for establishment of a sustainable intercity bus terminal.

2. LITERATURE REVIEW

The performance of transfer facilities has been evaluated by many researchers in different countries. Most of these studies are related to the evaluation of service quality of public transport bus services (De Ona, Juan, et al. 2015, Hencher, et al. 2010, Hencher, et al. 2007, Hencher, 2014 and De Ona, Juan, et al. 2016). De Ona Jaun, et al. (2016) evaluated the quality of the service of Metro Seville (a city in Spain) with the help of user and operator perceptions. Availability, accessibility, time, customer care, comfort and amenities and safety and security were considered as significant service attributes. A composite index was used to combine the points of view of users and operators for service quality evaluation. This study identified six different user profiles, and it was determined that different profiles have different opinions about the service of the Metro. This study concluded that users who have their own cars are more satisfied with the service of the Metro, whereas users who do not have other alternatives and use only the Metro are more critical of the service. Results suggested that if public transport operators offer high-quality public transport, then it will become an alternative for private car holders and will lead to a solution for environmental and social problems resulting from excessive use of private cars.

The study by Hensher and Prioni (2002) aimed to focus on the missing specification of contract performance service, which evaluates the generalised effectiveness of a service in satisfying users across a set of related dimensions. Construction of the multinomial logit model and the service quality index were used for this purpose. They concluded that if performance-oriented quality measurements can be derived for public transport, specifically for the tendering process for public services, there would be advantages in the short as well as in the long run. De Ona Jaun, et al. (2016) identified the index numbers for monitoring of the service quality (SQ). SQ over time may be helpful for improvement of the service index numbers. These index numbers may serve as a practical tool for evaluating service quality evolution. Simple index numbers originated as a useful tool for measuring the variation of each service aspect. Composite index numbers turned out suitable for the multidimensional service quality construct. Transport practitioners can easily monitor service quality through the index numbers.

One way to attract the general public towards public transport is to improve the service quality of public facilities. There is a need to evaluate public transport on the basis of different parameters. In this way poor areas will be highlighted, and after improving them, public transport will be able to obtain new users (De Ona, Juan, et al. 2016).

3. DATA COLLECTION METHODS

The findings of this research are based on questionnaire survey results. To fulfill the objectives of the study three questionnaires for drivers, passengers and administrators were designed, each consisting of two parts. For the driver's questionnaire; trip and personal information were asked in part one, i.e., age, trip destination, mechanism for boarding and alighting of passengers, average boarding and alighting time, fare mechanism and tracking information. Trip and personal information were asked in part one of the passenger's questionnaire, i.e., gender, age, trip purpose, mode used to access the terminal, destination city, mode used to access destination, expected waiting time, income, improvement of bus terminals in future and willingness to pay for improvement of bus terminals. Intercity Bus Terminal Information was asked in the questionnaire for administrators, i.e., Operating Agencies, Operating Hours, No. of Operators, Name of Operators, No. of stands, Total Fleet, No. of Routes, Area of Intercity bus terminal, Class of Intercity bus terminal, Total Passengers/Day, terminal fee and parking. Performance Assessment of the six PIs were asked in the second part of all the three questionnaires using the following scale: very bad, bad, average, good, very good. Details of measuring parameters of the six PIs is presented in Table 1. In this paper, results presented are related only to the comparison of user and driver perceptions in relation to evaluation of intercity bus terminal performance indicators.

These questionnaire surveys were conducted in Lahore during November 2013 to December 2013. Three survey teams were made, consisting of private university students, for implementation of surveys at selected locations within the study area. Each survey team contained three members with one team leader. All the members, along with team leaders, were trained. Eleven intercity bus terminals were selected in Lahore, seeking the objectives of the survey as shown in Fig. 1. It is important to mention that three (City Terminal, General Bus Stand (GBS) & Jinnah Terminal) intercity bus terminals are of C Class category, i.e., government owned, whereas the remaining eight (Rahber Travels, Niazi Express, Daewoo Lahore, Abdullah Express, Skyways Lahore, Ahmad Travels, Mian Travels & Mokal Travels) terminals are of D Class category, i.e., privately owned. Initially, the designed questionnaires were tested for concreteness and clarity through a pilot survey. The sample sizes for different intercity bus terminals are different depending upon the number of passengers using the intercity bus terminals. It is pertinent to mention that there are no computerized data available for the intercity bus terminals of Lahore. Only the Daewoo Express administrator has a computerized record of their passengers and drivers. Therefore, the sample size is decided on the basis of information provided by the administrators of intercity bus terminals. The respondents were selected randomly at selected locations and a total of 3,909 (2657 passengers, 1241 Drivers & 11 intercity bus terminals administrators) questionnaires were collected. The selected respondents were informed about the contents of the questionnaire and the filling procedure to ensure the respondent understood the questionnaire items and the reliability of the collected data. Results of 3,909 samples were used in the analysis.

4. RESULTS AND ANALYSIS

The main focus of this research is the evaluation of six performance indicators (Iseki et al., 2007) which are explained below along with their measuring parameters. As described earlier, the user's perspectives about the above-mentioned indicators are measured on a five-point Likert Scale from "very bad" to "very good" (Department of Transport, 2003). The presence and absence of all measuring parameters relevant to the performance indicators are checked and analyzed (Carol Taylor, 1990). Basic traveller's demographics and trip properties of users were evaluated. This was done in order to check the overall picture of the intercity bus terminal users for whom designers will design intercity bus terminals in future. This visual rendering includes the information given below:

- *Demographic properties* of travelers in terms of age, gender and income, etc.

- *Trip properties* such as trip purpose, mode used to access and exit the intercity bus terminal, destination city, expected waiting time before leaving/departure etc.
- *Evaluation of performance indicators*

Table 1

List of Measuring Attributes for each performance indicator

Safety and Security	Environment
1. Adequate lighting 2. Security guards 3. Emergency communication devices 4. Way for me to get help in emergency 5. Closed-circuit television camera (CCTV) 6. Monitoring cell / command and control center 7. Entrance Security: <ul style="list-style-type: none"> a) Manual checking Male b) Manual checking Female c) Metal detectors d) Walkthroughs e) Automatic cameras for still photos f) Trained dogs g) Scanners 8. Exit Security: <ul style="list-style-type: none"> a) Security guards b) Turnstile / Electronic Barriers 	1. Landscaping 2. Waste disposal 3. Proper drainage 4. Air circulation 5. Cleanliness in the terminal area 6. Encroachment inside 7. Encroachment outside 8. Noise
	Allied Facilities
	1. Shelter 2. Waiting Area/ (A/C) 3. Waiting Area /Fan facility 4. Seating arrangements for passengers 5. Ticketing booths 6. E-Ticketing booking via remote access 7. Restaurants 8. Telephone facility 9. Mosque 10. Masalah 11. Bank 12. ATM facility 13. Parking Area 14. Separate boarding (departure) and alighting (arrival) area 15. Combined boarding (departure) and alighting (arrival) area 16. Tuck shops 17. Toilets (Male/Female) 18. Hotels 19. Internet facility 20. Proper pedestrian's facilities exist? 21. Traffic circulation for private vehicles (e.g. cars, motorcycles etc.) 22. Ample luggage storage space 23. Bus wash bays 24. Maintenance /Repair area 25. Parking angle 26. Maneuvering space 27. Depot 28. Traffic circulation for buses 29. Fleet management
Access	
1. Linkage to nearby road 2. Linkage to connecting bus terminal. 3. Access for people with disabilities 4. Transfer vehicles facility	
Information	
1. Reception 2. Appropriate signage inside the terminal: <ul style="list-style-type: none"> a) Variable message signs b) Display boards 3. Appropriate signals inside the terminal 4. Marking on pavement for bus bays 5. Schedule information 6. Printed guided material (i.e. Route and Terminal layout information) 7. Telephone enquiry (operator) 8. Website information	
Connection and Reliability	
1. Buses leave on time 2. Buses arrive on time 3. Bus halts at fixed stands or not	

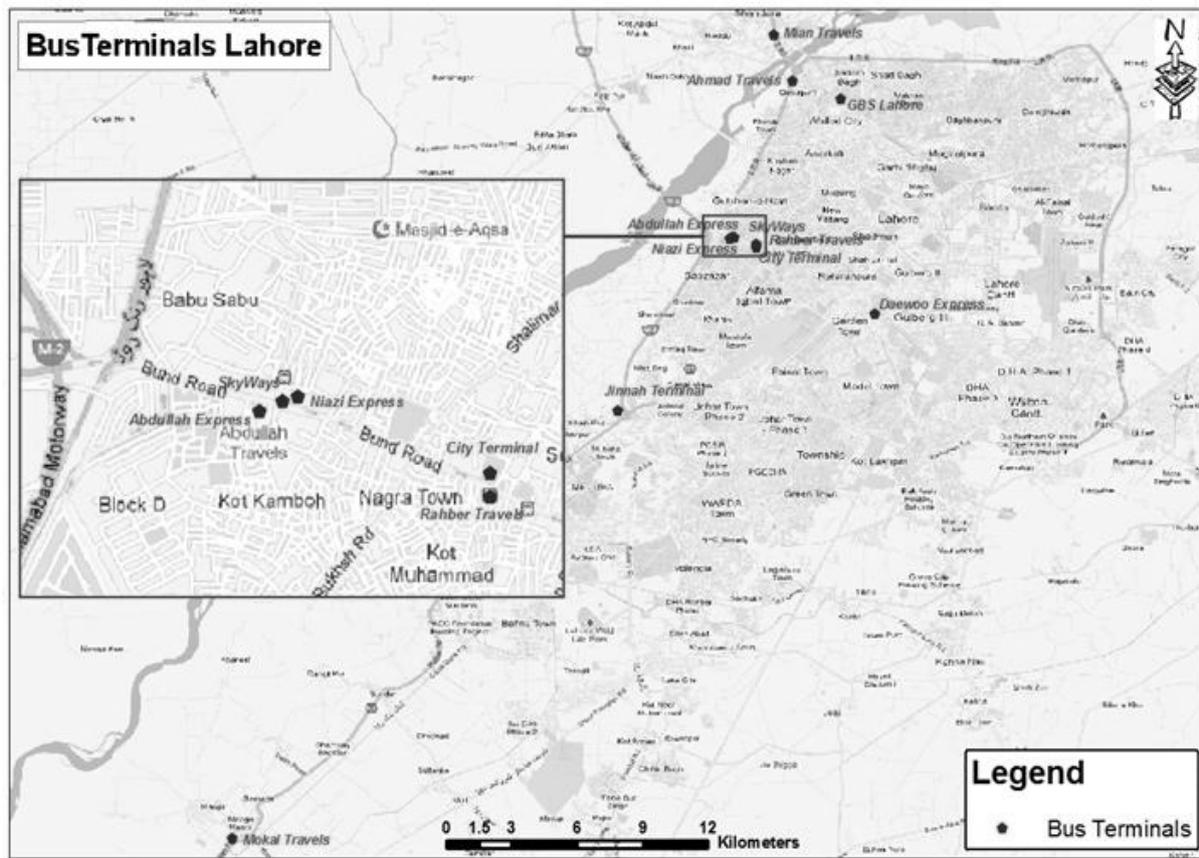


Fig. 1. Locations of Survey in Lahore, Pakistan (Source: Google Map)

4.1. Passenger Demographics

Results show that male users (75%) made a bigger contribution to the intercity bus terminal users compared with female users (25%). The possible reason for higher number of male users compared with female users is that they make more trips for work, education, social and other purposes. Fig. 2(a) shows the age distribution of passengers; most of them are aged between 20-40 years. Statistics in Fig. 2(b) show that 39% of travellers belong to 20,000 to 40,000 PKR and 30% fall within 10,000 to 20,000 PKR range. The users were asked about the access mode they used to approach the intercity bus terminals as this information is very important to provide proper parking facilities for the most frequently used access mode in the future. Users stated that there are various modes which they use to approach the intercity bus terminals and the distribution is shown in Fig. 2(c). Intercity bus terminal users were asked about expected waiting time before leaving/ departure. Fig. 2(d) shows that passengers usually need to wait 15-30 minutes before the bus leaves the intercity bus terminal. The maximum waiting time was more than 60 minutes. Expected waiting time before the bus departs from the terminal is very important for passengers as “time is money”; if passengers have to wait more, they will not prefer that particular service. Perceptions of intercity bus terminal users when asked about the future extension of intercity bus terminals and willingness to pay for better terminal facilities were as follows: most of the respondents, as shown in Fig. 2(e), agreed with the expansion of terminal facilities. Fig. 2(f) shows that more than 42% people have willingness to pay extra payment for better services. When passengers were asked about the boarding and alighting place, 79% said that buses board and alight the passengers at the bus terminal and 21% said anywhere on the road.

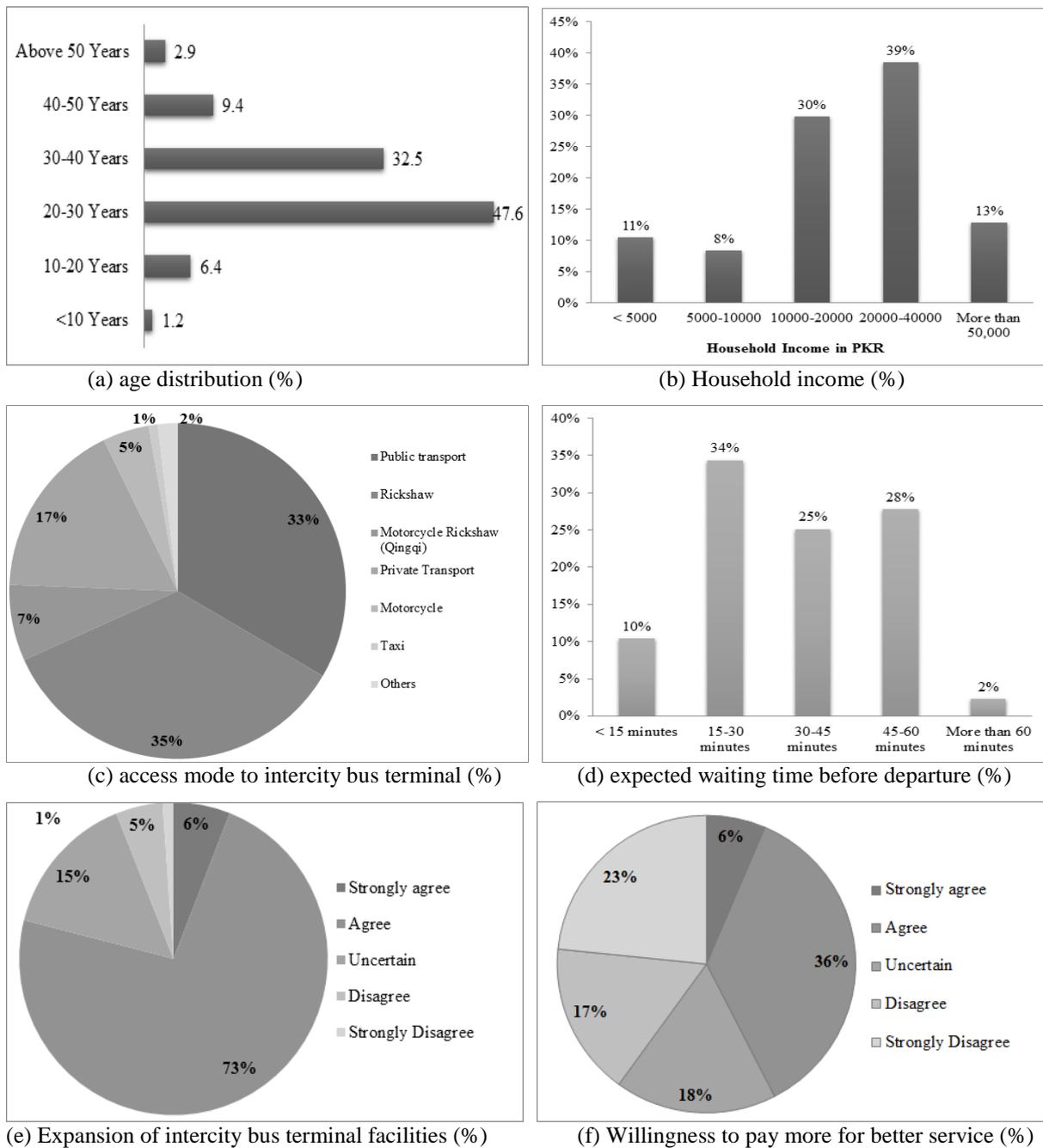


Fig. 2. Distribution of passenger demographics

4.2. Driver’s Demographics and Bus Service Features

Fig. 3(a) presents the driver’s age distribution and most of them are 30-50 years old. Vehicles normally take 15 to 30 minutes to board and alight passengers as shown in Fig. 3(b). Drivers have also mentioned non-regulated bus services which take more than an hour to board the passengers. Actually, drivers park the vehicle at the bay for an hour to attract passengers. Almost 79% of drivers said that the departure time for the terminal has been set on loading capacity, and 21% drivers said that they follow the time schedules to start the trip. This is a very important factor to attract travellers towards the public transportation system; as most of the terminals’ departure time is based on loading to capacity and passengers have to wait for more than 60 minutes.

Drivers were asked about the fare system they follow while starting intercity trips and 76% drivers said that the fare is government regulated and 24% reported that the fare is not regulated by the government. The reason for this difference is that for air-conditioned (AC) bus services, the fare is not regulated by Government; however, for non-AC buses, the fare is regulated by the government. Almost 73% drivers said that there is no tracking system in their buses. It was noted that 89% of the vehicles were parked in the proper terminal, 2% along the road side and 9% in other vehicles parking area.

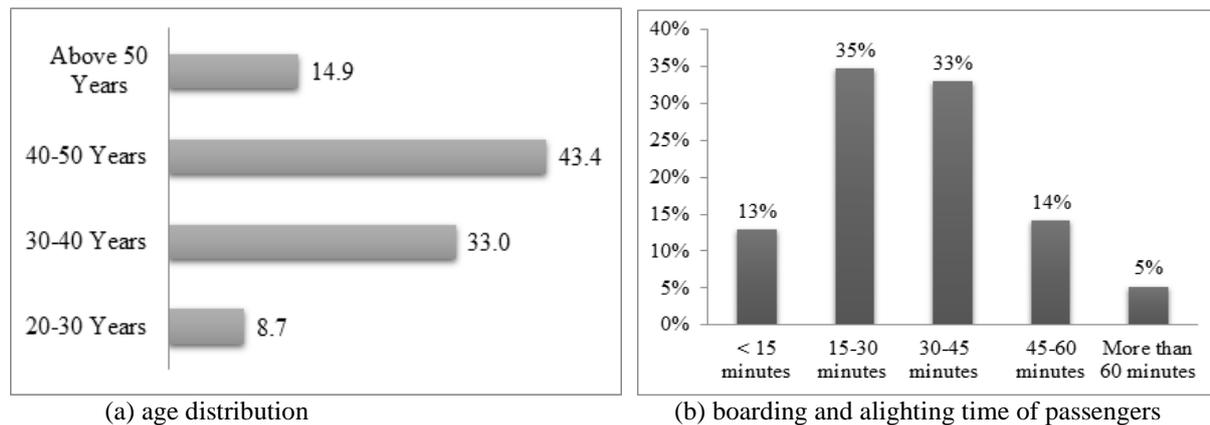


Fig. 3. Distribution of driver demographics and bus service features

4.3. Evaluation of Performance Indicators

Prior to the evaluation of performance indicators, the reliability of data was tested. Reliability of data is a significant quality to be considered while checking the validity of the assumptions. There are various definitions and kinds of reliability (e.g., internal consistency, retest, inter-rater) (Gadermann et al., 2012). For this study, reliability of data is checked by using “Cronbach’s Alpha” value. It was developed by Lee Cronbach in 1951 in order to provide a method for measuring the internal consistency of a test or scale; it is articulated as a number between 0 and 1 (Tavakoland Dennick, 2011). Table 2 shows the Cronbach’s Alpha values’ ranges and these values are used as a rule of thumb for the comparison of results.

Table 2

Cronbach's Alpha Value

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent (High-Stakes testing)
$0.7 \leq \alpha < 0.9$	Good (Low-Stakes testing)
$0.6 \leq \alpha < 0.7$	Acceptable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

Source: http://en.wikipedia.org/wiki/Cronbach%27s_alpha#cite_note-Cortina-8

The reliability of collected data at eleven sites is calculated using the SPSS software. The test results are shown in Table 3. The calculated value of “Cronbach’s Alpha”, for this research, for driver’s perception ranges from 0.56 to 0.97, and for passenger’s perception from 0.55 to 0.95. It shows that reliability of the collected data is in the range of acceptable limits.

Table 3

Cronbach's alpha values for each indicator

Intercity Bus Terminals	Passenger's Perception	Driver's Perception
Rahbar Travels	0.93	0.76
Niazi Express	0.93	0.97
Daewoo Lahore	0.85	0.63
Abdullah Express	0.66	0.75
Skyways Lahore	0.86	0.66
Ahmad Travels	0.71	0.88
Mian Travels	0.74	0.94
Mokal Travels	0.55	0.56
General Bus Stand (GBS)	0.72	0.81
City Terminal Band Road	0.86	0.76
Jinnah Terminal Thokar Niaz Baig	0.73	0.74

Safety and Security

It is observed that, overall, safety is not satisfactory. Some C-class terminals with good reputation covered their safety and security in a good manner, i.e., by providing walkthrough gates and armed security guards, like Daewoo Lahore. It is experienced that security guards are unarmed, untrained and mostly even without metal detectors. Daewoo Lahore, Ahmad travels, Jinnah Terminal and Rahbar travels 'safety and security' is on highest level according to the perception of the users, whereas Mokal Travels have the lowest rating regarding the safety and security of its terminal. The reason is that there is no proper lighting system in the terminal, no security guards and the condition of everything is very poor. Safety and security rating of the rest of the intercity bus terminals is given in Fig. 4.

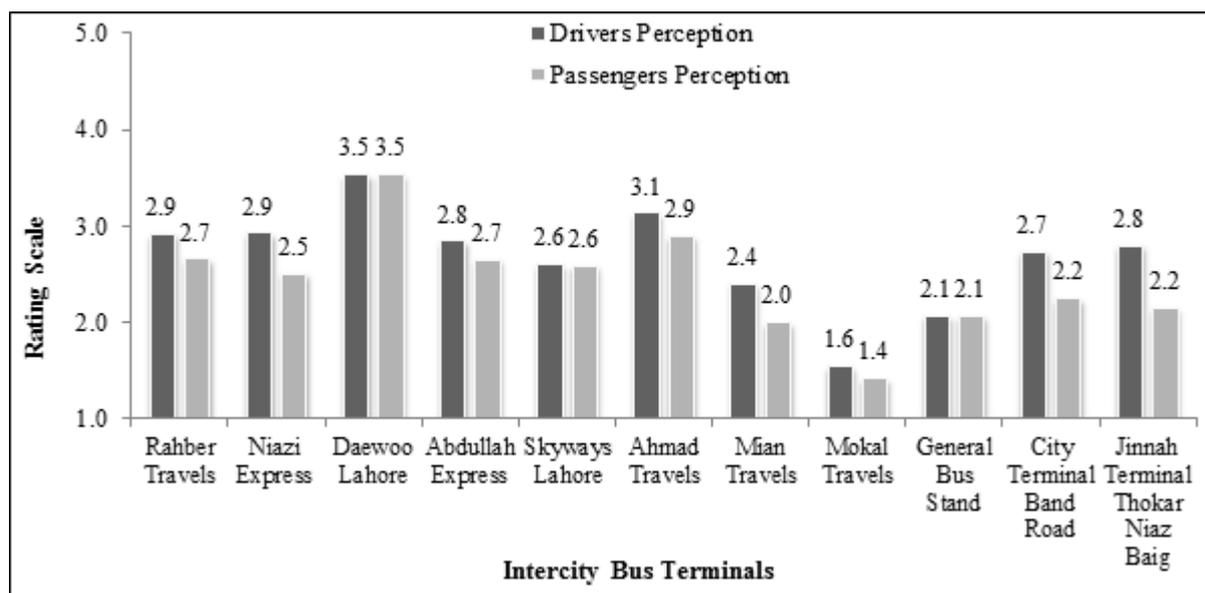


Fig. 4. Evaluation of safety and security

Access

Overall, access facilities of all the terminals are good and fit with the local public transport system. But some terminals are difficult to access, e.g., Jinnah terminal, Ahmad terminal and Mokal terminal. Intra city routes of local transport provide access to almost every terminal except those mentioned above. The accessibility level of the Daewoo bus terminal is the highest because it is on the Ferozpur road, near Kalma Chowk, and located approximately in the middle of the city. Mokal Travels is far away from the city, the Jinnah terminal is a newly constructed terminal and passengers have to travel a distance of approximately 1.5 KM from the main road to the bus bay location, compared with other terminals. This is the reason that both of these terminals' accessibility value lies below the minimum acceptable value. Ahmad Travels is far away from Batti Chowk and the availability of local transport is just at Batti Chowk. Rahber, Niazi Express, Skyways and General Bus Stand (GBS) are on the main roads and their access rating is high due to this. The rest of the access evaluation is given in Fig. 5.

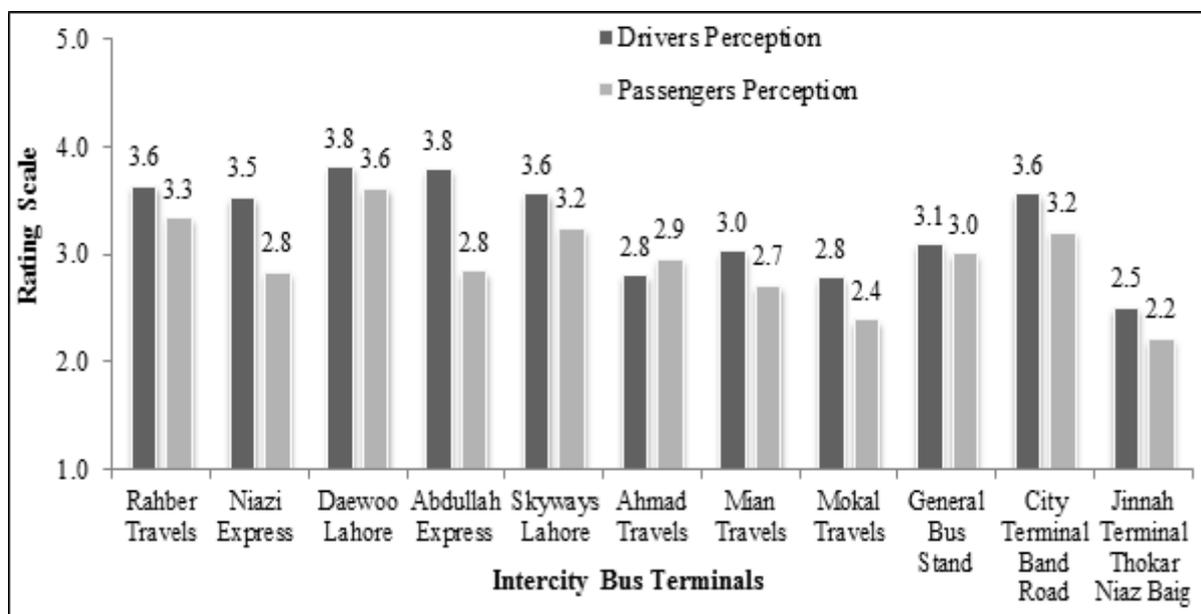


Fig. 5. Evaluation of Access

Information

Most of the terminals have a proper reception and sign boards in order to provide required information to the travellers. Some of the terminals also provide information on their websites, e.g., route, schedule and fare information. Daewoo, Jinnah and Niazi Express terminals are on highest ranking in information provision. Mokal, General Bus stand, Skyways are not good in this aspect. Display boards are in very poor condition, no announcement system for passengers is provided except in the Daewoo, Abdullah Express and the Rahber terminals. In addition, only Daewoo Lahore and Niazi Express' information are above the minimum acceptable value. The overall picture of the information system on the surveyed terminals is presented in Fig. 6.

Connection and Reliability

It is observed that information on the bus schedule, provided by the terminal administrators, regarding arrival and departure time, is reliable. The results of the connection and reliability analysis are mentioned in Fig. 7. It is clear from the results that the perception of users for this indicator is greater than 3 which shows that overall connection and reliability level is from average to very good. Only Mokal Travels' connection and reliability is below the minimum acceptable value.

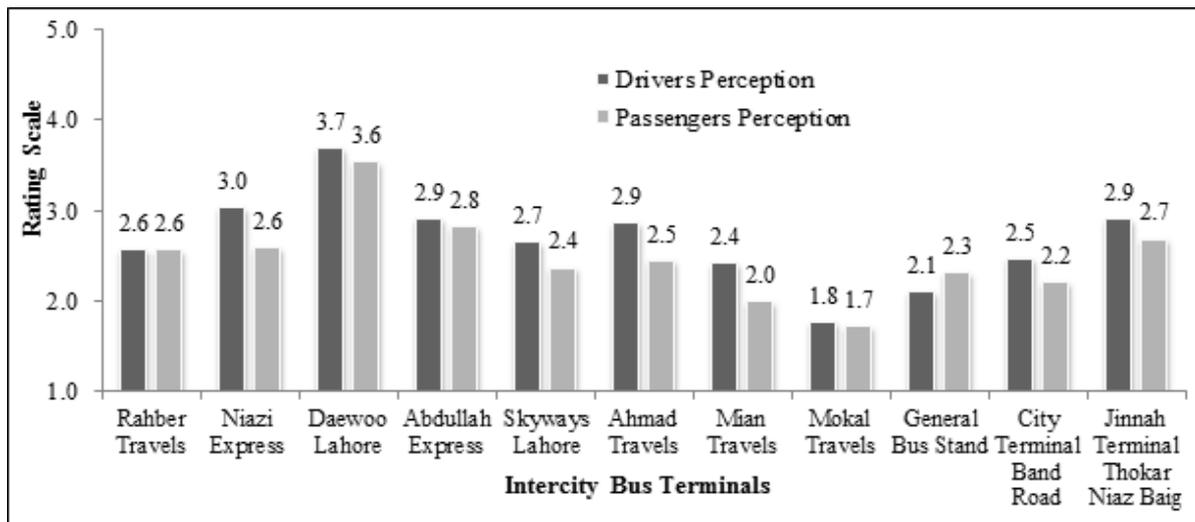


Fig. 6. Evaluation of Information

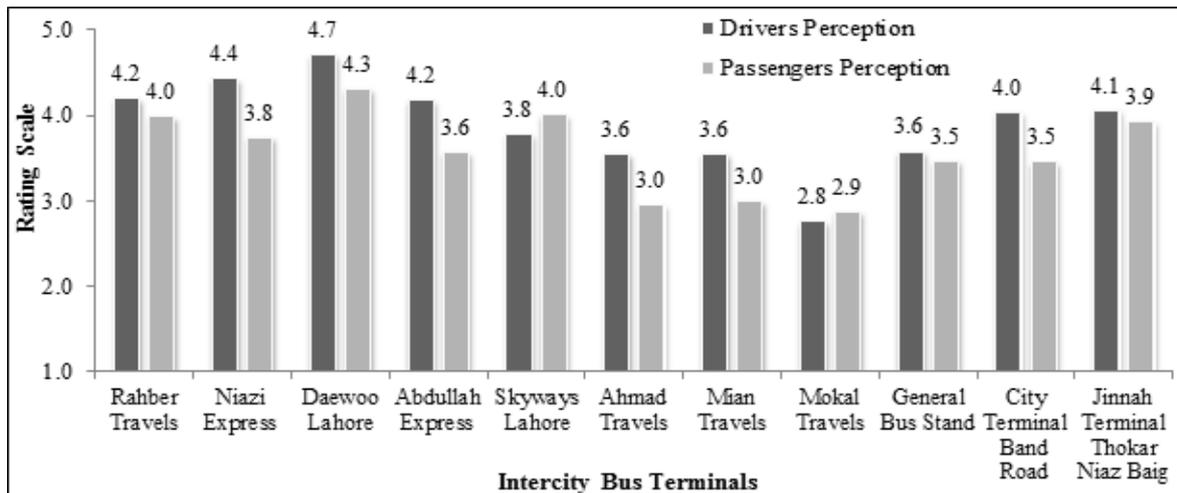


Fig. 7. Evaluation of Connection and Reliability

Environment

As far as environment is concerned, according to observation, intercity bus terminals are divided into two categories. One for high-class and one for low-class, high-level class terminals have a high fare and give satisfactory facilities in their terminal premises, but in the low-level class, the environment is very bad and users do not prefer their service. The results are mentioned in Fig. 8. Daewoo, Ahmad, Jinnah and Rahber travels are providing a good environment for their users. Only the environment of Mokal travels and General Bus Stand (GBS) is very poor and below the acceptable level.

Allied Facilities

Overall, intercity bus terminal facilities are satisfactory but facilities like tuck shops, free clean drinking water, clean and furnished floors are not satisfactory. The evaluation of facilities based on user perception is mentioned in the following Fig. 9 and this is ranges from average to bad.

Table 4 shows the summary of results of all the intercity bus terminals on the basis of performance indicators:

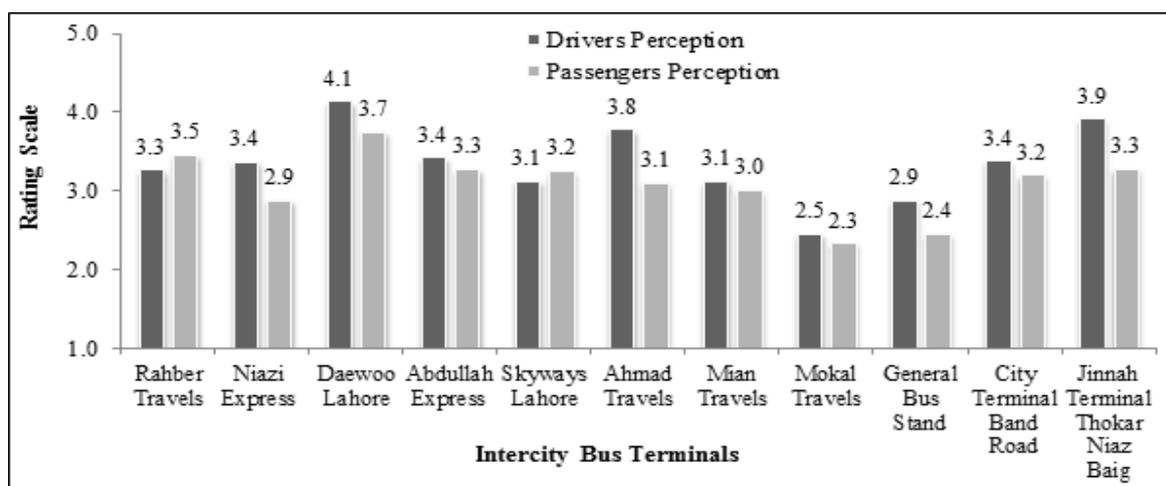


Fig. 8. Evaluation of Environment

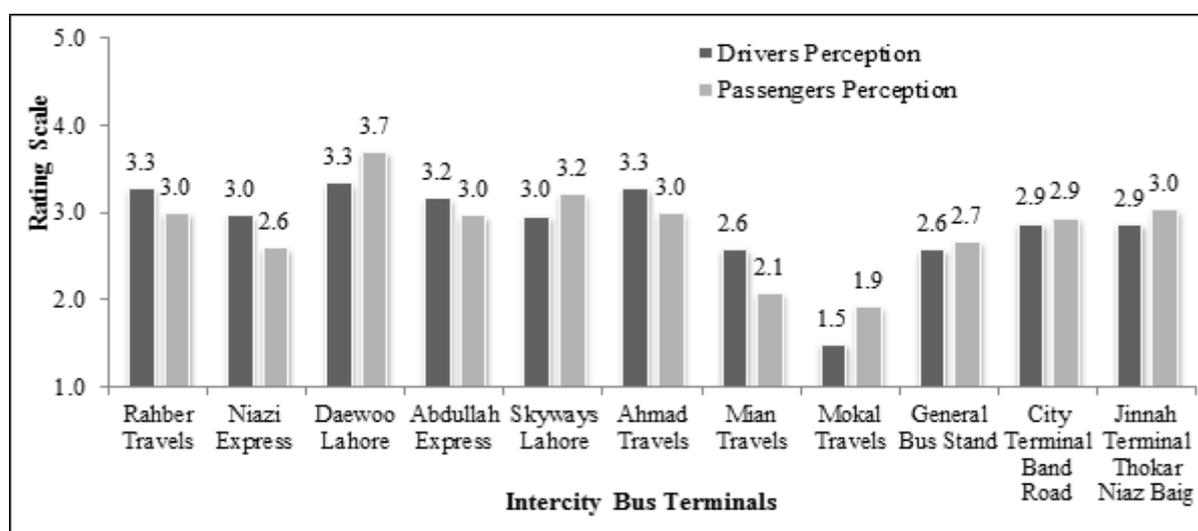


Fig. 9. Evaluation of Facilities

Table 4

Summary of Results

Sr. #	Intercity Bus Terminals	Minimum Score	Rate	Need Improvements in PIs
1	Daewoo Lahore	3.3	Average-Good	Facilities
2	Abdullah Express	2.7	Bad-Average	Safety and Security
3	Rahber Travels	2.6	Bad-Average	Information
4	Niazi Express	2.5	Bad-Average	Safety and Security
5	Ahmad Travels	2.5	Bad-Average	Information
6	Skyways Lahore	2.4	Bad-Average	Information
7	Jinnah Terminal	2.2	Bad-Average	Safety and Security & Access
8	City Terminal	2.2	Bad-Average	Safety and Security & Information
9	General Bus Stand	2.1	Bad-Average	Safety and Security
10	Mian Travels	2.0	Bad	Safety and Security & Information
11	Mokal Travels	1.4	Very Bad-Bad	Safety and Security

Performance indicators' ranking can be a helpful tool for transportation planners and engineers in making an appropriate decision regarding improvement in various aspects of terminal facilities. It will help planners to determine which indicator is the most important for investment as per the user's satisfaction. In this study, ranking of performance indicators is measured on a 5-level scale, i.e., '1= Not at all important', '2= unimportant', '3= neutral', '4= important', '5= most important'. Ranking of indicators is shown in Fig. 10. Users ranked 'safety and security' as the most important performance indicator, i.e., ranked first, access ranked second, connection and reliability third, allied facilities fourth, information fifth and environment ranked sixth.

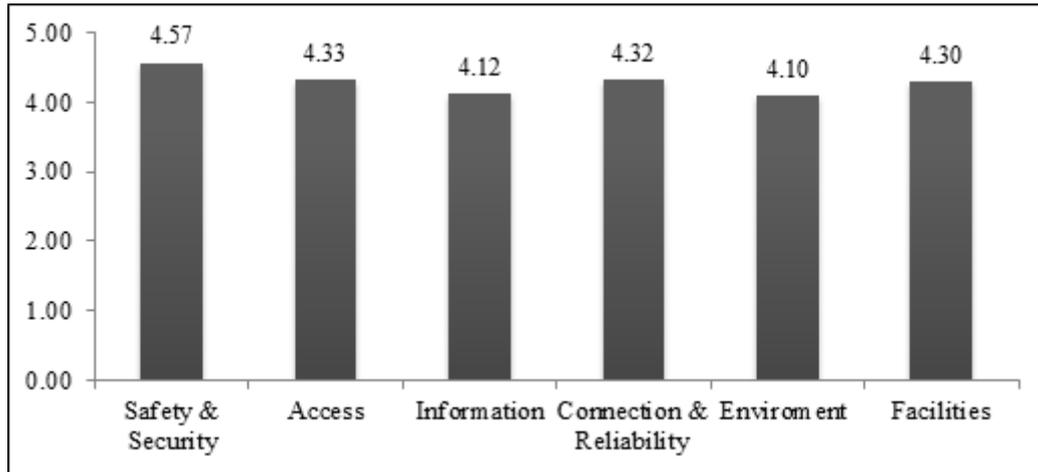


Fig. 10. Ranking of Performance Indicators

4.4. Ranking of Intercity Bus Terminals by Customer Satisfaction Index (CSI)

User's satisfaction is very important in order to take a decision on choosing public transportation over private transportation. If travellers are satisfied with a journey by public transportation, then, in the future, they will prefer to journey by public transport. We can say that evaluation of the satisfaction index is a very important factor for attracting travellers towards public transportation (Eboli and Mazzulla, 2009). This is calculated by dividing the means of user's satisfaction rates and weighted importance rates. The formula is given in equation 1:

$$CSI = \sum_{k=1}^N [\bar{S}_k \cdot W_k] \quad (1)$$

where, \bar{S}_k is the mean of the user's satisfaction rate, and W_k = the importance-weighted rates; specifically, it is the ratio between the mean of the importance rates expressed by users on the 'k' attribute and the sum of the average importance rates of all the service quality attributes (i.e. \bar{I}_k) and it is calculated using equation 2.

$$W_k = \frac{\bar{I}_k}{\sum_{k=1}^N \bar{I}_k} \quad (2)$$

The ranking of eleven intercity bus terminals according to the user's satisfaction is given in Fig. 11. According to this ranking, Daewoo Lahore terminal got the highest ranking, whereas Mian and Mokal got the lowest ranking.

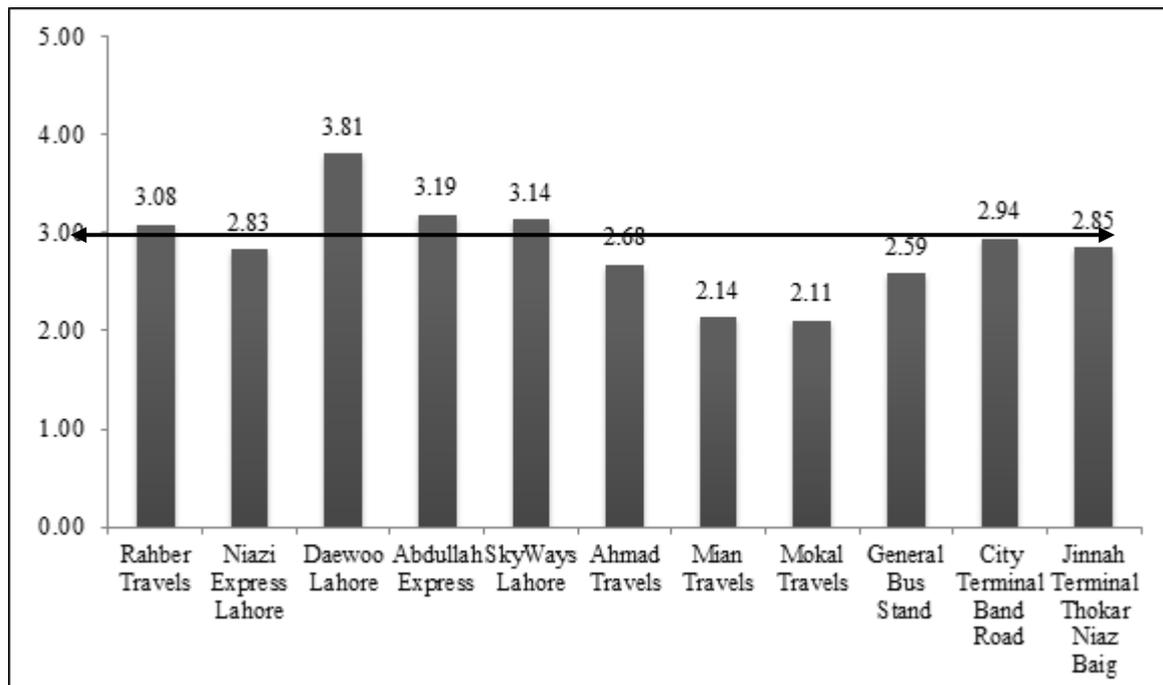


Fig. 11. Raking of Intercity Bus Terminals on CSI

5. CONCLUSIONS

After the evaluation of intercity bus terminals based on different perceptions, it has been concluded that the performance of privately owned intercity bus terminals is good in comparison with government-owned intercity bus terminals. Similarly, users rated privately owned bus terminals with higher ranks compared with government-owned bus terminals. Furthermore, safety and security is most important among the performance indicators while choosing intercity travelling. It is also concluded that, there are no proper and well-defined regulations and guidelines for the development of intercity bus terminals. Monitoring and performance evaluation should be based on the six performance indicators. It is suggested that planning and designing any intercity bus terminals should be based on proper evaluation as per user's perceptions, and the findings of this study can be helpful in this regard. For collection of accurate real time data of travellers, a computer-based ticketing system must be implemented. Information regarding schedules and route plans must be available on web sites (online help desk portal) and other sources. There is a need for amendment in the Motor Vehicles Rules 1969. Park-and-ride facility must be provided to attract passengers for shorter intercity movement like Sheikupura, Gujranwala, Patoki, Kasure and Sunder, etc. Proper integration is required between urban public transport facilities and intercity transit terminals in order to make them more useful and attractive to the travellers.

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