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Study on Bus Transportation System and Its Role in Urban Traffic (Case Study: Dezful City,Iran)

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ABSTRACT: In regard of the ever-increasing development of the cities and the urban services, the citizens' welfare has been more attended. The public transport affords to avoid any citizen's wasting time and satisfy them by providing services, thus such issues have had the urban practitioners' special attention for the urban transportation planning. The bus stop delay in the bus stations is one of the parameters affecting the quality of the transportation planning in the bus transportation system. For the purpose of identifying the bus stop delay factors and its accurate prediction, in addition to the more accurate schedules, the proper policies should be taken to reduce bus stop delay and increase the passengers' satisfaction, while waiting or being transported in the stations. This study aims to investigate many solutions for the public transportation and the bus transportation system in Dezful city in order to reduce traffic and delays at the highest level of quality and elegance having sense of safety and comfort for the users. This research was conducted by survey. According to the questions in the questionnaires given to the bus drivers in Dezful city and the bus passengers, it is indicated that there is some delay in Dezful city bus network for reaching the bus station, which has had some troubles, e.g. the lack of park and ride routes causing many motorcycle, car and walker accidents as well as the high traffic and bus delays and finally the factors refrain from the bus network in Dezful city include the personal vehicles, waste of time when using the bus, crowdedness in bus and inadequate space in busses and the higher use of taxi.
Keywords: Transportation, Bus Network, Bus Station, Traffic, Vehicles, Dezful

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INTRODUCTION

The public transportation includes the transportation systems which suggest that the passengers should not travel in their own cars so the transportation would be provided rather for the general population than exclusive transportation. The public transportation is usually dedicated to rail, bus, and passenger ship systems (www.ttic.ir).

The first means of the public transportation in Iran was the horse wagon implemented by Belgians after the implementation of Hazrat-Abdol-Azim railway in Tehran (Parnian, park and ride site). In 1952, the law was regulated for the establishment of the cities' public bus companies in the national constitution council and the governance was assigned to the municipality, as the bus company of Tabriz was founded in the same year. The first bus was employed by a Belgian businessman in Rasht and, after the constitutional revolution; the bus transportation system was established in Tehran.

The urban bus companies were active in 1960s, so the bus companies were founded in Mashhad, Rasht, Isfahan, Kerman, and Urmia (consultant engineers and traffic planners in Tehran). Before the victory of the Islamic revolution in 1971, the equipped urban bus networks reached 14 cities, as some cities, e.g. Shiraz, Bushehr, Abadan, Kermanshah, Gorgan, and Babol, had the advantage of the bus transportation network. After the Islamic Revolution, 33 bus networks were added (Taghvaei and Vafaei, 2008).

By the increased population and the expansion of the cities, people have required more connection with each other, which has the environmental impacts, e.g. air pollution, increased travel time, and decreased safety, crowdedness in the modern traffic of the residents.

Today the urban traffic and the delay in the bus arrival time to the bus stations has caused the circumstances for the users on being with the mental comfort and satisfaction, which are the rights of citizenship so that they can benefit from the public transportation system (Moeini, 2010).

The reduction of the usage of the public transport affected by some main stations due to the heavy traffic and lack of park and ride sites and the lack of public vehicles would waste passengers' time and cause accidents.

Many researchers and literature focus on the field of the public transport and the traffic problems, for example, Amin Naseri and Baradaran (2010) performed a study entitled "effective factors on the bus stop delay in the bus stations and its prediction in the bus transport system in Tehran". Ebrahimzadeh and Baharlou (2012) performed a study entitled "evaluation of effective factors on the bus transport system and its role in urban transportation, a case study in Zahedan" and Talebi Tooti et al. (2012) conducted a study entitled "effective factors on quality of public transportation system", which require the knowledge and evaluation of the public transport since the current transportation system has some scientific design and equipment troubles in the bus stop delay and the lack of the park and ride site and the necessary facilities at the bus stations in the transport network, including the uneven distribution in the city, high density

at commercial points and non-compliance as many deficiencies occur during the two-way transportation.

The bus network organization has taken some strategies to solve the problem by changing the paper ticket system to the electronic payment, which reduces the bus stop delay at the stations. These problems have led to the heavy traffics, motorcycle and vehicle accidents and finally the passengers would be dissatisfied. In order to solve the traffic problem, the causative factors of the heavy traffics should be identified. The establishment of the park and ride sites in the main stations and the increase of the number of the busses on Thursdays as well as the changes in the appearance of the station canopy may be a solution for this problem in all seasons.

This study aims to reduce the traffic throughout the city and establish the public order by the implementation of this plan in addition to the beautification of the urban furniture. Thus plan will reduce any delay and beautify and enhance the quality of the stations as well as increasing the usage of the higher quality public transportation

Hypothesis

The lack of the extended overall location of the stations and the lack of the dedicated park and ride sites have caused some delay in the bus arrival time to the bus stations. Moreover, the beauty and the quality of the bus stations have very significant impact on the usage of the busses.

MATERIAL AND METHODS

Since the researcher has gathered the relevant information about the public transportation in Dezful city by using the questionnaire, this study has been done by survey. The statistical population in this study are the bus passengers and the personnel of the bus transport organization in Dezful and outskirts. Since it is not possible to distribute and collect the questionnaires among the total target population, the random sampling method is used and 350 subjects are selected as data collection sample. The researcher has manually analyzed the data by using the statistical methods.

Data collection tools

The researcher has referred to the relevant library resources, e.g. articles, theses, and the various websites, including the official website of the bus transport network in Dezful. Also the bus transport network in Dezful was directly attended and the personnel were interviewed for the data collection. This study was conducted by survey therefore the researcher has gained information of the traffic problems in Dezful by questionnaire. The questionnaire has 12 questions in the context of the objectives and hypotheses.

Transportation and its performance

Today, the developed countries including North America apply many methods and techniques to organize the urban transportation system, which are mentioned as:

A) regulation of demand, including land usage, traffic taxes, parking limits, physical restrictions, fuel and car taxes, distribution of working hours, parking around the cities,

B) enhanced usage of existing networks, including local network bottlenecks, central control system, traffic lights, familiarity with network, priority to public transport, parking prohibition, improved safety devices, instant dealing with accidents, traffic control during construction,

c) Human environment conservation, d) traffic forecasts, physical development of transportation network, and economic evaluation (Zarivani, 1992).

Generally, the classification criteria on the different types of the public transport models are studied in the three main components:

a) prioritization condition (priority right),
b) service system approach,
c) the applied technology (traffic consulting engineers in Tehran, 2005).

In fact, according to the public transportation model, the extent of the shared road in the traffics is assessed and classified in three categories by priority. These three categories include respectively: A, B, C.

Category A: In this category, the intersection and routes are used in the public transportation in separate or non-coplanar coordination. An obvious example is metro and monorail in this category.

Category B: In this category, the street pavements are separated from the public transport. This separation can include different curbs, fences, and barriers, however, the level of the urban traffic intersections are jointly used (coplanar pavements).

Category C: In this category, the public transport vehicles use jointly the existing urban streets and intersections.

In this case, some special traffic line may be allocated or distinguished by some color and lines. In fact, the right of priority passage has three public transportation models including the defined transit streets and semi-rapid transit (Uuchic, 2003).

Geographical location of Dezful city and metropolitan bus system

Dezful is located in the Khuzestan plain sections by the nearly 4762 square kilometres area in the extent equal to 7844 square kilometres. This city is located in the distance 721 km from Tehran and 155 km from Ahvaz. The suburban and urban bus network system was established in Jun, 2/1990. The personnel were 53 individuals including 12 administrative staff, 20 service staff, and 21 contractual employees. 96 busses including 31 governmental busses and 65 private busses in this organization and only 12 busses are active in the public.

RESULTS AND DISCUSSION

The lack of station location and the causation of the delay in the bus stations

The following table indicates the passengers' traffic volume at different times on Thursdays.

Failure to locate stations and bus delay

The following table indicates the displacement volume of passengers at different times on Thursday.

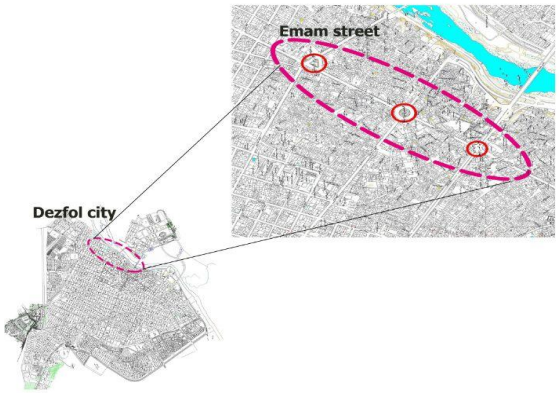

Figure 1. study area map in Dezful city

Table 1. Passenger transportation at stations on Thursdays

Time shift	Frequency	Percent
6-8	140	40
10-12	30	8.57
12-14	120	34.28
16-18	50	14.28
18-20	10	2.87
Total	350	100

According to Table 1, most passengers transport in 6-8 o'clock at 40 per cent ratio and 28.34 percent are transported at 12-14 o'clock and the least passengers' transportation is 28.14 percent at 16-18 o'clock at, 57.8 percent travel at 10-12 o'clock and 85.2 percent travel at 18-20 o'clock. Therefore the bus transport network in Dezful city has more delays on Thursdays and other days.

Table 2. Bus Delay on days other than Thursday in each station

Delay time	Frequency	Percentage
3-5 min	200	5.57
5-7 min	70	20
7-9 min	50	14
More than 10 min	30	50.8
Total	350	100

As seen in Table 2 the bus transportation per day occur except Thursday at each station according to most respondents, as 7.57% between 3-5 min in 20% between 5-7 minutes and 28.14 percent between 9-7 minutes, and 57.8% per day are more than 10 minutes except Thursdays and it causes more delay at bus stops.

Table 3. Bus delay on Thursdays at each station

Delay	Frequency	Percentage
Between 3-5 minutes	20	5
Between 5-7 minutes.	30	9
Between 7-9 minutes.	70	20
More than 10 minutes	302	66
Total	350	100

The bus delay data in Table 3 shows that the maximum delays occur at each station by 71.65 percent in more than 10 minutes on Thursdays and the delays is 20% in 7-9 minutes and 57.8 percent transport at 5-7 minutes and 99.1% have delay in 3-5 minutes as the drivers should avoid the delay time at the stations. Tables 4 and 5 indicate the bus stop station delays due to the delay stop time at the station.

Table 4. Bus stop distance schedule at every station except Thursdays

Stop time	Frequency	Percentage
3-2 min	270	77.15
3-5 min	80	22.85
5-7 min	0	0
More than 7 minutes	0	0
Total	350	100

As can be seen in Table 4, most respondents (99.26%) express that busses stop at every station for 2-3 minutes and 85.22 percent for 3-5 minutes. None of the respondents at the bus stops delay for 5-7 minutes or more than 7 minutes. The good ideal schedule should be proper at the station for the passengers.

Table 5. Maximum time in stations

Stations	Frequency	Percent
Terminals	90	25.73
Square and Mosalas intersection Imam	180	51.42
Imam Khomeini Square	80	22.85
Total	350	100

Table 5 indicates the maximum time that a stop at the station 42.51% of respondents to a stop at the intersection, Imam Square, Mosalas, 71.25 percent complete, 85.22 percent expressed in Imam Khomeini Square. The dwell time at stations is causing chaos in the field of transportation.

Park and ride busses and traffic delays due to lack of park and ride site shortage is felt in some stations Dezful city.

Table 6. Park and ride requirement

Terminals	Frequency	Percent
Imam Khomeini Square	80	23
Mosalas Square	150	43
Imam Khomeini Crossroad	120	34
Total	35	100

Table 6 shows the results of a Mosalas with a 28.42 percent, the greatest need is Park and ride site Imam Khomeini and the intersection with 28.34% and Imam Khomeini Square with the 85.22% also expressed the need to Park and ride site. Due to the lack Park and ride site's bus network routes should act towards park riding.

Table 7. Highest traffic stations

Stations	Frequency	Percent
Terminals	110	31.42
Square and Mosalas intersection Imam	190	54.28
Imam Khomeini Square	50	14.82
Total	350	100

Table 7 indicates the most traffic at the station in Imam Khomeini Square and Mosalas Square with 28.54 percent, terminals with 42.31%, and Imam Khomeini Square with the 57.8 percent.

The following table shows the routes with the most pedestrian accidents at the bus network.

Table 8. Most pedestrian accidents, bus routes

Pathways	Frequency	Percent
Mosalas Square	150	42.85
cloverleaf	170	48.57
Imam Khomeini Square	30	8.58
Total	350	100

Table 8 indicates the statistics for most pedestrian accidents at Imam Khomeini with 57.48% of the estimates. Then Mosalas Square with the 85.42 percent, Imam Khomeini Square with the 57.8 percent are located. The table below shows the route most car accident in which a motor coach bus network occurs.

Table 9. Higher car accidents, motor bus route

Pathways	Frequency	Percent
Mosalas Square	240	68.57
cloverleaf	40	11.43
Imam Khomeini Square	70	20
Total	350	100

Table 9 shows the Mosalas filled with 57.68 percent, 20 percent and Imam Khomeini Square with the 42.11 more busses where motor car accident occurs.
Several factors have caused the passengers of public transport vehicles do not use some of them are mentioned in the table below.

Table 10. Major transport problems

Difficulties	Frequency	Percent
Shortage of busses	50	14.28
High traffic volume	160	45.72
Bus Delays	140	40
Total	350	100

Table 10 indicates that traffic volumes up to 71.45 percent of the major transportation problems Dezful city is considered that after a delay of busses with a 40 percent shortage of busses with a 28.14 percent respectively in Categories 2 and 3.

Impact on the beauty and quality of bus stations

There awning and beautiful appearance of the bus station can be used to great effect in that it specifies the data table below.

Table 11. Stations and aesthetic impact on the level of user's use of the bus shelter

Replies	Frequency	Percent
Very high	300	85.73
Average	40	11.42
Low	10	2.85
Total	350	100

Table 11 indicates the visual beautification of the bus station with canopy for the users. The 71.85 percent on very high number, 42.11 percent on average, and 85.2 percent said they have little impact.

Reasons for not using busses

Some public transportation system for the movement of passengers using the following table shows the reasons.

Table 12. Reasons for not using busses

Non-use	Frequency	Percent
Having your car	180	51.44
Time when using the bus	70	20
Overcrowding and inadequate space on the bus	50	14.28
Using the taxi	50	14.28
Total	350	100

Table 12 indicates that the personal car is used at 42.51 percent as the most important reason for not using busses, which at level of 20% would delay busses, overcrowding and inadequate space on the busAnd use a taxi with a 28.14 percent are other factors that may cause the bus.

CONCLUSIONS

According to the research findings, most times when the bus network is transporting passengers at 6-8 am and 12-14 pm, there is usually the delay in the bus stations except Thursdays and on Thursdays which has 3-5 min delays more than 10 min. The bus stop at the station except Thursdays is 3-2 minutes in square and Mosalas Square and Imam Khomeini Square. In order to solve the problem of the urban traffic delays and the bus routes in the study, more than any other routes in the Mosalas are needed for the park and ride site. Because there is greater volume of traffic in this route and most motor car and pedestrian accidents occur in this path. One of the chief problems in the transportation in Dezful is the high traffic volume and bus delays. Despite the beautification and the quality of the bus network which can be much effective, there are many factors, e.g. personal vehicles, crowdedness, and improper inadequate spaces in the busses and the usage of taxis are among the reasons for not using the busses.

Suggestions

By the establishment of park and ride sites in the mentioned bus stations, the traffic volumes can significantly reduce and the quality of the bus stations whether in cooling-heating systems or beautification are those important factors which give the feeling of safety and comfort to the passengers and can encourage the citizens in the public transport. The comprehensive mapping of the suburban bus lines should have the park and ride facilities. The horizontal lining in all stations across the city and the cornering and constraints can be made. The Intelligent Fleet Management System can be established which play a major role in improving the transportation. The main axis in the city is the route of Imam Khomeini (North-South and vice versa) and only 12 busses transport publicly. On Thursdays due to the heavy traffics and the grave visits, the busses have detours to reach destination and it causes some delays and the passengers are dissatisfied, if the busses would not have

detours, the delays will eliminate. The standardization of the distance between the stations is 350 to 550 meters to reduce the bus delays.

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