Factors That Effect On Shifting Employers To Use Public Transportation At Al-Hilla City By Logit Method

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Abstract: This study aims to suggest public facilities and encourage employers to use these facilities to decrease the use of private transportation. Using Al Hilla city as an example, the study involves a survey conducted on employers during the three month (march –may) (2017–2018).A total of 300 questionnaires were personally distributed inside the center of Al Hilla city and interviews were conducted with the employers. The survey results obtained the following statistics: 58% (the majority) of the people use cars inside the city, 31.4% take the bus, 7.6% use motorcycles, and 3% (the least percentage) use bicycles &walking. there are some strategies to improve using bus are increasing parking fees inside the city , increasing the number of buses inside the city and make it free are also effective means to use bus transportation and make the time between facilities reasonable .

Keywords: traffic engineering, transportation Shifting, logit method, Al-Hilla city, public mode,

1 INTRODUCTION:

Al-Hilla city is a main stop for trucks and buses traveling from neighborhood. Population density of Babylon government is about 326persons/km2.The rapid increase in the use of personal transportation has its roots in the weak public transport system in the city. Private transportation inside Al Hilla city is causing of global warming also pollution and increased energy usage[1], so we need improves the public transport for the health and well-being of individuals. A substantial shift from using cars to using public transport can reduce urban congestion and the environmental harm caused by air and noise pollution[2]. This study aims are finding solutions and ways of encouraging the use of public transportation inside the city and evaluates the effects of using public transport on the forms of transportation inside the city.

2 STUDY METHODOLOGY

A survey was conducted to study the impact of the public Scheme. Microsoft Excel 2010 and the logit choice model were used to analyze the data.

2.1 Logit Model:

The logit model was used as the final model in examining the behavior of travelers to highlight the way they consider and decide what mode of transportation to use [3]. The suggested model used to determine the dependent variables is evaluated based on the following equation:

$$y = \frac{1}{1+e^{-f(x)}} \quad \text{.....Eq .(1)}$$

where f(*x*) is an analytic function of *x*. Given this equation, the single-layer network is made identical to the logistic regression model. This function has a continuous derivative that permits the use of the function in back propagation. The following functional form is used in this study to determine the variables:

$$p = \frac{1}{1+De^{\alpha(\text{variable})}} \text{ . ....Eq.(2)}$$

2.2 Logit Function

Any explanation of logistic regression must begin with the logistic function:

$$F = (z)\frac{1}{1+e^{-Z}} \text{ .....Eq.(3)}$$

This equation was used to examine the calibration process based on the values of *D* and α, which were obtained from the ANOVA using Microsoft Excel. The results were used in the final equation (1) and to validate the model based on the following equation [4].

3 RESULTS AND DISCUSSION

The factors influence on shifting to public transport for car & motorcycle users have been discussed as**:**

3.1 Increasing Parking Fees:

Figure1 shows that the employers will change their mode when we increase parking fees to1500 ID per hour with (27%) but there is (73%) of them still insist in using private vehicle. This percentage still increasing until it reach to (98%) with parking cost 3500 ID per hour .

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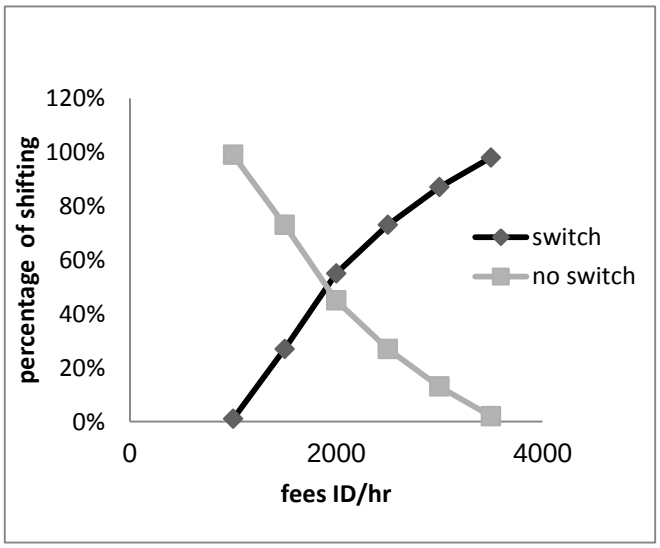

***Figure 1**. Switching to bus if parking fees increased*

It is as given in table(1) that the model resulted from ANOVA and regression statistics is highly correlated with survey results obtained from questionnaire and analyzed. The high correlation between survey results and logit model is clarified in Figure 3 where both of the survey results and the modeled one for were increased with the increasing of parking fees per hour.

***Table 1:** Survey result and data calibration*

Parking fees per hour	Survey results(P)	(1-p)/p	Ln(1-p)/p
1000 ID	0.03	32.33	3.47
1500 ID	0.27	2.703	0.994
2000 ID	0.55	0.818	- 0.200
2500 ID	0.73	0.369	-0.994
3000 ID	0.87	0.149	-1.900
3500 ID	0.98	0.02	-3.891

From this results shown and after regression analyses in excel we got the ANOVA table which is important to get the variables ($\propto$, D) . ln D =2.120171, D = 8.3325, $\propto$= -0.27419.

$$p = \frac{1}{1+8.3325e^{-0.27419(parking\ fees\ per\ hour)}} \quad (4)$$

***Table 2:** Survey results and logit model results*

Parking fees per hour	Survey results(P)	Logit model
1000 ID	0.03	0.1719
1500 ID	0.27	0.3209
2000 ID	0.55	0.6506
2500 ID	0.73	0.8800
3000 ID	0.87	0.9665
3500 ID	0.98	0.9798

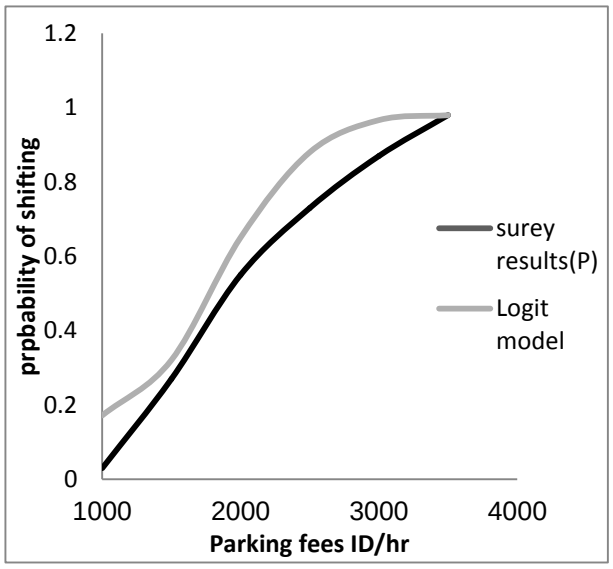

***Figure 2.** Parking fees per hour that will support bus*

3.2 Increasing number of buses & make it free:
Our results of the survey shows that (3.06%) will switch to bus when increasing No. of free buses by (10%), while (96.94%) said they can manage it even the No. of buses increased or make it free to this rate. The percentage of switching to bus continuously increased when the rate of free buses number increased. Finally if the increasing percentage became 90% around (92.85%) attract leave their (car or motorcycle) and using bus and the percentage of refusing about (7.15%).

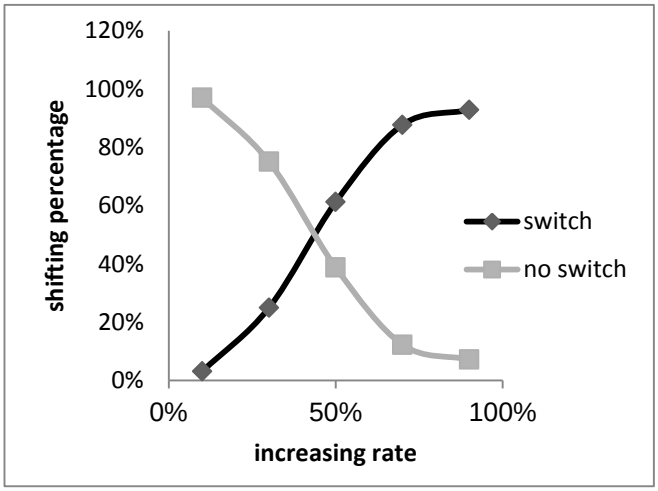

***Figure 3.** Switching to bus if the No. of buses increased &make it free*

From this results shown and after regression analyses in excel we got the ANOVA table which is important to get the variables ($\propto$, D) of equations , ln D = 3.69145 , D= 40.10295 , $\propto$= -7.5565 & P=0.003<0.05.F significant=0.00342 .Correlation factor(R) =0.97.The high correlation between survey results and Logit model is demonstrated in Figure 4 where both of the survey results and the modeled were increased with the increasing free buses frequency.

$$p = \frac{1}{1 + 40.10295e^{-7.555(increasing\ rate)}} \quad (5)$$

Table 3: *Survey result and data calibration*

Parking space decreases rate	Survey results(P)	(1-p)/p	Ln(1-p)/p
10%	0.0306	31.679	3.455
30%	0.2489	3.017	1.104
50%	0.6122	0.633	-0.457
70%	0.8775	0.139	-1.973
90%	0.9285	0.077	-2.563

Table 4: *Survey results and logit model results*

increasing rate	Survey results(P)	Logit model
10%	0.0306	0.05044
30%	0.2489	0.1939
50%	0.6122	0.5216
70%	0.8775	0.8317
90%	0.9285	0.9572

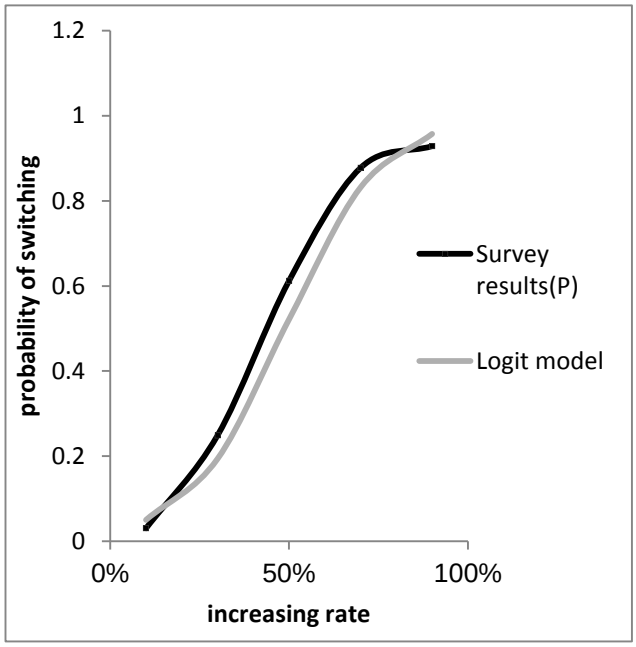

Figure 4.*Switching to bus if the frequency of free buses increased*

3.3 Reasonable time for public mode inside the city :

From the figure above, most of employers prefer using bus if the time between facilities less than 15 min with percentage (97 %) and only (3%) of them refused using bus .When the time between the origination and destination increased to (15-20 min) some of employers don't prefer using bus with (10.23%) but the employers who prefer using bus still good percentage around (89.77 %).When the time increased to (20-30 min) the percentage of them decreased to (64.28%) while (29.59%) of employers agree to use bus if the time is from (30-40min).Only (7.14%) from employers would like to shift at time of (more than 40 min).

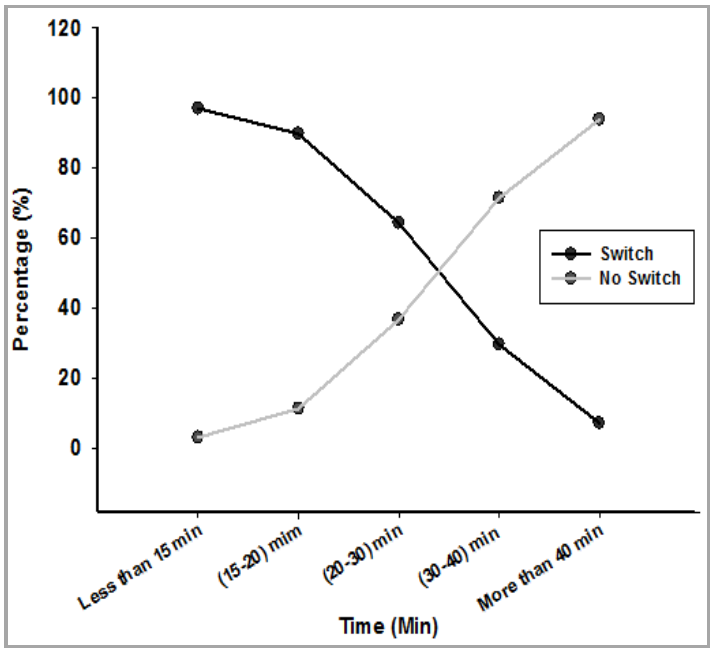

Figure 5.*Reasonable time inside the city*

Table 5: *survey result and data calibration*

Reasonable time	Survey results(P)	(1-p)/p	Ln(1-p)/p
10 min	0.97	0.0309	-3.476
20 min	0.8977	0.1139	-2.1719
30 min	0.6428	0.5556	-0.5877
40 min	0.2959	2.3795	0.8668
45 min	0.0714	13.005	2.5653

From this results shown and after regression analyses in excel we got the ANOVA table which is important to get the variables ($\propto$, D) of equations, ln D =-5.70788, D=0.00331970, $\propto$= 0.174648. Our model is significant since P=0.0007<0.05.F significant=0.000732 .Correlation factor(R) =0.99. This fact is more identified in Figure 6 which illustrates high correlation between survey results and the modeled one that they showed increasing shifting when the time decreased.

$$p = \frac{1}{1+0.0031970\ e^{0.174648(time)}} \quad (6)$$

Table 6: *Survey results and logit model results*

Reasonable time	Survey results(P)	Logit model
15	0.9795	0.98199
20	0.8995	0.90487
30	0.6428	0.62389
40	0.2959	0.22437
45	0.0714	0.10778

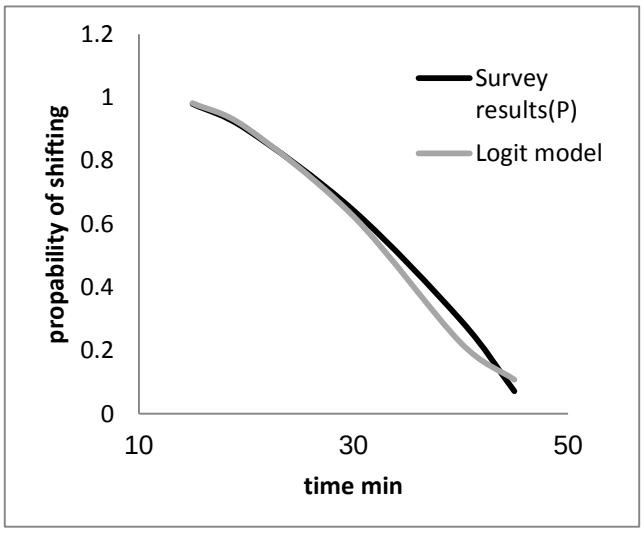

Figure 6. *Reasonable cycling time (min)*

4 CONCLUSION

The main goal of this paper is to provide public transport facilities to encourage employers to use these facilities to decreases using car& motorcycle also determines the factors effecting on transport mode and finding appropriate model for shifting employers in Al - Hilla city from private car to public transport. Our analysis of the results showed that the commuters behavior in transportation mode choice influenced by availability of facilities of public transportation system. There are some ways to encourage employers to use public transport instead of their mode such as increasing number of buses & make it free , providing special lane for bus. There are different ways to discourage employers to use private car & motor cycle such as increasing fees on parking, limiting the parking space can help to shift employers to public mode.

5 RECOMMENDATIONS &SUGGESTIONS TO ENCOURAGE PUBLIC TRANSPORTATION

- We should take in to consideration the past experiences and successful experiments of the other countries that been similar situations and do not repeat the mistakes that was done in other countries.
- Our suggestion are increasing parking fees, increasing number of buses inside the city and make it free because in our survey we cleared that most of employers affected on this factor and accept shifting from car and motorcycle mode to public mode.
- Improving safety factors to encourage employers to using bus inside the city such as using facility guidelines (provide maps that show roadway conditions (shoulder ,traffic volumes, etc.).

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