Modelling Car Parking Choice using Microsimulation Traffic Model

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Abstract

Town centre parking management policies involve a mix of controlling factors including parking charges, parking capacity, mobility of pedestrians and disabled motorists, parking durations, parking guidance information systems, and car park accessibility to restrict car dependency. Town centre microsimulation models that include parking choice models based on above parameters can provide town planners with an effective tool to evaluate their parking management policies. In this paper, we present the methodology for developing a car parking choice model based on the above set of parameters, and including it in current microsimulation frameworks.

The present work is based on postal questionnaire surveys conducted at car parks in two different areas in the UK. The objective of the surveys was to understand the factors that affect the car parking choice, such as catchments for various car parks, reason for choice of car park, choice for alternate car parking facility, and the impact of free parking space or business paid parking on parking choice.

1 Introduction

Policy makers use car parking management as a tool to provide trip end restrains. However, it is equally important to ensure that the car parking spaces are both accessible and functional. Thus, in considering the town centre parking management,

local authorities look at parking charges, parking capacity, mobility of pedestrians and disabled motorists, parking durations, parking guidance information systems, and car park accessibility to restrict car dependency. In order to estimate the impact of these policy measures, it is important to integrate the above parameters in form of a parking choice model within the existing traffic simulation frameworks. This paper explains a LOGIT based parking choice model which can be integrated with the traffic microsimulation models as part of route search for vehicles. The present work is based on two separate traffic assessment studies conducted in the West Bromwich town centre area near Birmingham and Sutton Coldfield town centre in North Birmingham in UK, with the help of area-wide VISSIM microsimulation models.

These models include model parking choice as a part of route search and traffic assignment. West Bromwich and Sutton Coldfield are vastly different town centres in terms of social-economic activities and demographic distribution. Where West Bromwich is an old industrial hub which also acts as a regional centre, Sutton Coldfield mostly contains high value residential developments and a busy High Street.

Postal questionnaire surveys were conducted at various car parks in the above town centres to understand the factors that affect car parking choice, including catchments for various car parks, reason for choice of car park and choice for alternate car parking facility. In addition, the impacts of other factors like entitlement to free parking space or business paid parking were also determined.

The above data was used to develop a car parking choice model, where drivers selected different parking spaces according to the ‘Attraction’ levels of individual car parks. In the future scenario models, sensitivity of various parking management

policies like variable parking fees, dynamic parking information systems, relocation of car parks and land use changes were tested and their impact on the parking choice and traffic was analysed.

In this paper, we present the methodology for conducting the parking surveys, developing a LOGIT based car parking choice model and including such choice algorithms in current microsimulation frameworks.

2 Parking choice for car based trips

Drivers start their journey with a pre-determined parking destination in mind. This initial choice is based on various factors including their driving experience, knowledge of the area, parking duration and accessibility of the car parks. However, if drivers are unable to find a parking space in the first choice car park, they look for an alternate car parking space. This alternate choice depends on many factors including availability of space, local knowledge, parking fees, parking duration and accessibility of the car parks. Not surprisingly, from our survey results we find that 29% of the people prefer to find the closest available car park, while 23% people considered likelihood of finding space while determining alternate choice. Figure A.1 shows the above choice algorithm for selecting a parking facility in form of a flowchart.

2.1 Parking Choice in VISSIM

For integrating parking choice models in microsimulation framework, various simulation packages were considered. In the end, PTV's VISSIM microsimulation package was used for the modelling purpose.

Over the course of the project, Mott MacDonald has worked with PTV to further enhance the functionalities and weed out any bugs if necessary. In the end, we used VISSIM 4.2 (version 03), where we had a robust dynamic traffic assignment tool which can model route choice and responses to intelligent route guidance systems such as the 'dynamic parking choice decisions'.

In addition, based on the available data, one can model parking choice explicitly on the basis of a utility based LOGIT model. In VISSIM's simulation environment, it is possible to model multiple car parks as part of one destination zone; thereby giving LOGIT based choice to vehicles to park in different car parks. Vehicles can be modelled to choose their preferred parking lot on the basis overall utility of the choice. In addition, responses to car park capacities and search for alternative car parks, if the car parks are full can also be implemented.

2.2 Factors affecting parking choice

Based on the above insight and considering VISSIM's LOGIT model capabilities, parking choice questionnaires were designed to find out the factors affecting parking choice in the two town-centres. After an initial design of the questionnaire, pilot surveys were conducted to understand any other factors, other than those found available in current literature, which may be affect parking choice. It is understood that the factors affecting parking choice can be classified into two categories of attributes.

The first set of attributes, which include car park attributes such as opening and closing hours, duration of stay, parking fees, safety and cleanliness etc, may remain static throughout the selection process for a parking facility. On the other hand, the second set of attributes, which affect the dynamic choice decisions, include accessibility of the car park, distance from the starting point of the journey, availability of space etc and vary according to time and location of the vehicle. However, the benefit function which will determine the choice of car park will remain the same throughout the trip, i.e., while making the initial choice or while making the alternate choice. The main parameters found in the two sets of attributes are summarised below in Table 2.1.

Table 2.1: Main attributes affecting parking choice

Static Choice Attributes	Dynamic Choice Attributes
Parking fees	Distance to the car park
Opening Hours	Likelihood of finding space
Duration of stay allowed	Free parking/Low parking fee
Trip purpose (business or otherwise)	Parking fees
Familiarity with the destination area	Car Park Attraction *
Length of stay allowed	
Safety	
Sheltered car park	
Cleanliness	

* please refer to Section **Error! Reference source not found.** for more details

Here, 'Car Park Attraction' is the relative attractiveness value of each car park, which can directly affect choice of car parks. This 'Attraction' value is nothing but a sum total of all the static attributes, which reflect a stochastic distribution of car park choice. Section **Error! Reference source not found.** describes in detail the methodology developed for calculating the relative 'Attraction' values for each car park.

2.3 Factors affecting '*Benefit Function*' for parking choice

VISSIM has the capability to model LOGIT based car parking choice for trips. The parking choice benefit function, used for this LOGIT model, is based on 'Dynamic Choice Attributes' as summarised in Table 2.1. Based on the pilot survey reviews, eight parameters were found to affect the ***Initial Choice*** for a car park. These are as shown in Table 2.2 (in no particular order of importance)

Table 2.2: Factors affecting Initial Choice for a car park

Easily accessible on your route
Close to your final destination
Likelihood of finding space
Free parking/Low parking fee
Length of stay allowed
Safety
Sheltered car park
Cleanliness

In addition, seven more parameters, as shown in Table 2.3, were found to affect the choice of ***Alternate car parking*** facility in the event that the driver did not find a space in the ***Initial Choice*** car park.

Table 2.3: Factors affecting Choice of Alternate car park

Close to first intended car park
Likelihood of finding space
Free parking/Low parking fee
Length of stay allowed
Sheltered car park
Safety
Cleanliness

2.4 Modelling parking choice in VISSIM

The parking choice benefit function in VISSIM allows all the 'Dynamic choice attributes' as shown in Table 2.1, including the abstract 'Attraction' variable. Equation (1) describes the parking choice benefit function used in VISSIM:

Parking Utility (VehTy) =

$$+ a_1 \times \text{Parking Fees}$$
$$+ a_2 \times \text{Distance* from Destination Zone}$$
$$+ a_3 \times \text{Distance* from Current Position}$$
$$+ a_4 \times \text{Space availability}$$
$$+ a_5 \times \text{Car Park Attraction} \quad \ldots \text{Eq 2.1}$$

Where,

a_1 to a_5 are the coefficients for the corresponding variables

Distance* is the total cost of remaining trip (V_t x Time + V_d Distance)

VehTy is the Vehicle Type for which the Utility is being calculated

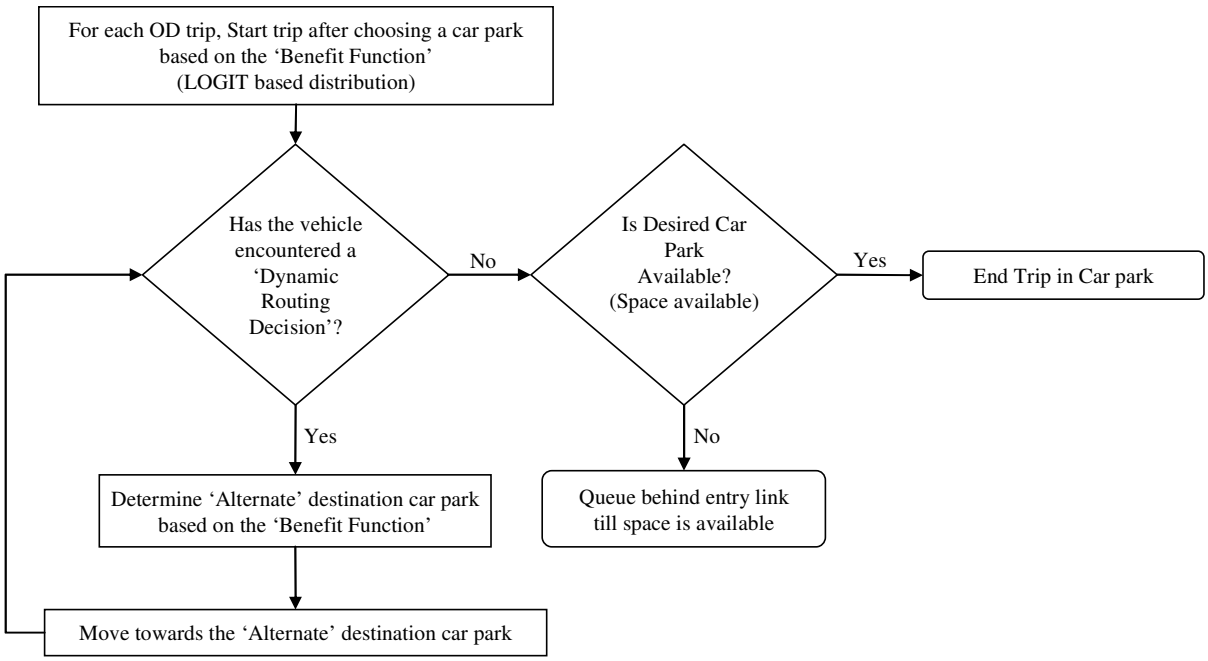
Parking fees, car park opening hours, allowed duration of stay and 'Car Park Attraction' are attributes that are constant for all vehicle type. However, the cost of the trip, represented by Distance* in Eq (1) depends on the 'value of time' (V_t) and 'value of distance'(V_d) for individual vehicle type. Function coefficients a_1 to a_5 and the 'Car Park Attraction' values are calculated from the survey responses, as described in section 3.

Figure 2.1 shows the parking choice decisions at various stages of an OD trip in VISSIM. The ***Initial Choice*** of the car park is determined on the basis of above benefit function at the start of the trip (at the origin point). If no 'Dynamic Routing Decision' is encountered, vehicles queue till they find a parking space in the desired car park. However, if the vehicle encounters a 'Dynamic Routing Decision' at any point in the journey where it can re-evaluate the choice the final destination car park based on one of the following pre-defined options:

1. Determine alternate choice if original car park has fewer than predetermined number of spaces left;
2. Determine alternate choice if original car park has no spaces left; and
3. Re-calculate 'parking utility' for all vehicles, for all original car park choices.

The 'Dynamic Routing Decision' can be placed at any strategic point where modellers believe that drivers will have to re-consider there choice. This includes entry points/links near the car parks, on links before congested junction and also at locations where 'Dynamic Parking Information' is provided to the drivers.

Figure 2.1: Parking choice decisions in VISSIM



3 Parking surveys

Appendix B shows the final questionnaire used for the parking surveys. The parking surveys were conducted as a postal questionnaire survey using the questionnaires distributed at the car parks. The major areas covered in the questionnaire were:

1. Origin-Destination, including the final destination for the trip;
2. Trip purpose, using information about the origin and destination locations (e.g. Home to usual work place is Commute trip);
3. Trip length for the car trip (approximate).
4. Reasons for initial choice and alternate choice car park.
5. Distance (in terms of walking time) to the final destination after the end of car trip.
6. Other information about disability benefits, reimbursed trips and season tickets.

A variety of car parks were surveyed in both the town centres. These included short-stay car parks (not more than 2 hours stay), long-stay car parks (6-8 hours stay) and on-street parking locations (not more than 30 minutes stay). Table C.1 and Table C.2 shows a summary of car parks surveyed in West Bromwich and Sutton Coldfield town centres.

3.1 Survey responses

The survey responses received from the two town centres were distinct. This can be attributed to differences in demographic profiles in the two town centres, and also in the nature of socio-economic actives in West Bromwich and Sutton Coldfield.

In total, 1026 responses were received from Sutton Coldfield parking surveys. However, only 391 responses were received from the West Bromwich surveys. The moderate response rate from the West Bromwich parking surveys can be attributed to a number of reasons including extremely adverse weather conditions on the survey date, lower car usability and high proportion of non-English speaking ethnic minority population in West Bromwich. A detailed analysis of the parking surveys is presented in Appendix C

3.1.1 Initial choice of car park

The analysis of West Bromwich survey data reveals that of all the responding drivers, 33% consider walking distance to final destination, 27% consider accessibility on the route, and 15% consider likelihood of finding parking space as most important factors affecting parking choice. Only 10% drivers find parking fees as a critical factor, which can be owed to comparatively low current parking charges in West Bromwich.

In Sutton Coldfield, 28% consider walking distance to final destination, 17% consider accessibility on the route, and 20% consider likelihood of finding parking space as most important factors affecting parking choice. 11% drivers in Sutton Coldfield feel parking fees is a critical factor for parking choice.

In addition, 6% drivers in West Bromwich and 14% drivers in Sutton Coldfield rate safety as an important criterion.

3.1.2 Alternate choice of car park

In West Bromwich, 29% of the people prefer to find the closest available car park, while 23% people considered likelihood of finding space while determining alternate choice. Also, 18% drivers consider parking fee and 12% consider safety as important criteria for selecting alternate car park.

In Sutton Coldfield, 36% people considered likelihood of finding space, while 32% of the people prefer to find the closest available car park while determining alternate choice. 16% drivers consider parking fee and 8% consider safety as important criteria in Sutton Coldfield for selecting alternate car park.

It is important to note that while the percentage proportion driver choosing various parameters may be different, the relative ranking of the choice attribute remain the same in both town centres.

4 'Attraction' based Parking Choice

'Car Park Attraction' is an abstract variable, which can be used as an aggregate value for all the static car park attributes in the benefit function, as shown in Table 2.1. This 'Attraction' value is a function of all the car park attributes like 'duration of stay allowed', safety, cleanliness and parking fees etc.

The 'Attraction' value is the relative attractiveness of the car park vis-à-vis other car parks in the modelled area or in the choice set. It represents a stochastic attractiveness value for individual car parks which can skew the benefit function on the basis of user choice. The 'Attraction' value is treated as a constant for each car park, which can be scaled against the 'Attraction' value for other car parks in the model boundary, using the survey responses.

4.1 Calculating 'Relative Attraction'

The 'Attraction' value for each car park was calculated on the basis of responses where drivers had parked their cars in the *Initial* choice car park. The value for 'Attraction' was taken as the relative value of the sum of the static variable standing in the above set of responses. For example, the relative attraction of a car park A vis-à-vis car park B is the ratio of number of drivers who considered safety as a important criterion and chose car park A to the number of drivers who chose car park B. Total 'Attraction' for any car park was taken s a weighted average of the attraction ratings for all the static parameters including 'Duration of stay allowed', 'Safety', 'Cleanliness', and 'Shelter'. In the end, parking facility with the least attraction score in each of the model was given an 'Attraction' value of 10, and the rest were scaled to find the relative 'Attraction' of each car park.

Table 4.1 summarises the relative 'Attraction' value for the surveyed car parks in West Bromwich. Not surprisingly, on-street parking spaces on the High Street were found to be the least attractive option, whereas the Multi-Storey with shelter and over 800 mixed parking spaces was found to be the most attractive parking option. The calculated 'Attraction' values were found to have a positive correlation with the capacity of the car park and 'Duration of stay allowed'.

Table 4.1: Relative 'Attraction' value for car parks in West Bromwich

S.No	Car Park	Stay Duration	Capacity	Attraction
1	Queen Street	Short Stay (2 hrs max)	395	18
2	Multi Storey	Mixed	845	72
3	Spon Lane	Short Stay (2 hrs max)	293	26
4	Oak Road	Long stay	339	53
5	High Street (on-street)	Very short stay (0.5 hrs max)	36	10
6	Council house	Long stay	300	26

Table 4.2 summarises the 'Relative Attraction' value for the surveyed car parks in Sutton Coldfield. Due to similar nature of car parks in Sutton Coldfield, the 'Attraction' values for all the car parks is approximately the same, where car park capacity is the only variable which plays any significant role. The 'Attraction' values as calculated above and the coefficients for the 'Dynamic Parking Choice' attributes were put in the VISSIM models, and the models were calibrated and validated for the base year scenario.

Table 4.2: 'Relative Attraction' value for car parks in Sutton Coldfield

S.No	Car Park	Stay Duration	capacity	Attraction
1	Railway Road	Short Stay	200	12
2	Newhall walk (on-street)	Short Stay	190	10
3	Gracechurch Mall	Short Stay	240	12
4	Victoria Road	Short Stay	80	11
5	Upper Holland	Short Stay	140	11
6	Station Street	Short Stay	100	10
7	Lower Reddicroft	Short Stay	120	10
8	Upper Reddicroft	Short Stay	60	10
9	Good Hope Hospital	Long stay	450	11

4.2 Calculating benefit function coefficients

The above survey responses can be used to provide relative coefficients for the benefit function. As the same benefit function is used for the *Initial* and the *Alternate choice* car parks, the average of all the responses were taken. 'Easy accessibility of the car park on the route', which is the only parameter not common between the two choices in the survey is measured through 'Distance* from the current position' parameter in the benefit function, which is same as 'Closest to first intended car park' in the *Alternate choice* in terms of model output calculations. In addition, all the responses for the static choice attributes were grouped together to calculate the relative response for the 'Attraction' parameter. Table 4. shows percentage split of the responses which were used as the coefficients for the benefit function.

Table 4.3: Parameter coefficients for the parking choice benefit function

Parameter	West Bromwich	Sutton Coldfield
Parking fees	11	12
Distance from Zone	26	17
Distance from current position	31	28
Space Availability	16	21
Attraction	17	23

4.3 Calculating Stochastic Probability

The stochastic probability of choosing a parking lot and corresponding subset of paths is based on the following two equations (Eq 4.1 and 4.2).

$$Utility(U) = e^{-[\beta(K)]} \quad \text{..... Eq 4.1}$$

Where, β is the Logit Scaling factor (taken as 0.05) and K is the overall cost based on the Equation 2.1.

Hence, the probability of choosing a path *i* is calculated as:

$$P_i = \frac{U_i}{\sum_{Alli} U_i} \quad \text{.....Eq 4.2}$$

Table 4.4 Shows a sample calculation, where 800 vehicles ending in a zone have been assigned if the parking choice is assigned on the basis of 'Attraction' only.

Table 4.4: Parameter coefficients for the parking choice benefit function

S.No	Car Park	Stay Duration	Capacity	Attraction	Utility	Scaled Utility	Probability	Trips
1	Queen Street	Short Stay	395	18	9	1.57	10.31%	82
2	Multi Storey	Mixed	845	72	36	6.05	39.77%	318
3	Spon Lane	Short Stay	293	26	13	1.92	12.59%	101
4	Oak Road	Long stay	339	53	27	3.76	24.73%	198
6	Council house	Long stay	300	26	13	1.92	12.59%	101

5 Conclusions

The VISSIM microsimulation models for West Bromwich and Sutton Coldfield town centres were developed with dynamic parking choice models as described above. The base year models were calibrated and validated up to standards described in Design Manual Road and Bridges (DMRB) Volume 12 Section 2, Part 1.

Integrating the above 'parking choice model' in the town-centre wide microsimulation models has given local authorities in West Bromwich and Birmingham an efficient tool to test the impact of land-use changes on the parking lots. In addition, the model can also be used to test the sensitivity of various parking management strategies in the local areas. Various sensitivity tests have been carried out to test location of car parks, suitability and location of 'Dynamic Parking Information Systems', parking fees etc. using the above models. These results will be presented as a part of a separate paper at a later date.

6 Scope of further work

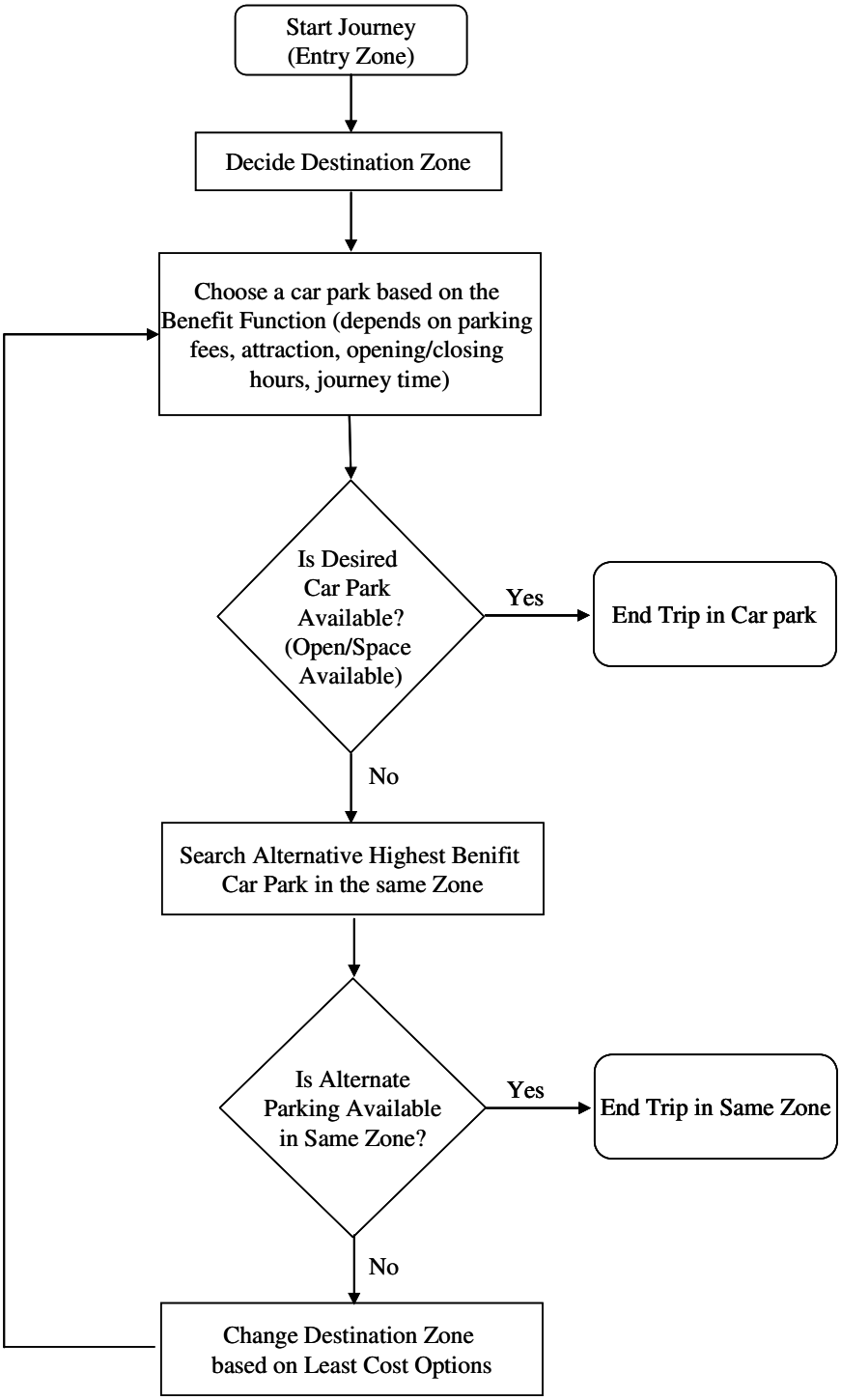
The methodology described above can be easily adapted to develop parking choice models for any location. It was interesting to note that even though the two town centres surveyed in UK were vastly different in terms of social-economic activities and demographic distribution, the parking choice is predominantly based on similar set of parameters. However, further surveys must be carried to evaluate various car parks so that 'Attraction' values for these car parks can be regressed and not just estimated.

7 Acknowledgements

The authors would like to thank Sandwell Metropolitan Borough Council and Birmingham City Council for supporting and funding the development of West Bromwich and Sutton Coldfield microsimulation models respectively. The authors would also like to thank Dr. Tom van Vuren for his valuable input in the development of survey questionnaires and methodology.

Appendix A Parking Choice Algorithm

Figure A.1: Parking Choice Algorithm for selecting final parking destination



Appendix B Survey Questionnaire

West Bromwich Parking Survey 2006

Sandwell Metropolitan Borough Council is conducting surveys into the travel patterns of people in and around this area. This information will be used to plan future transport requirements. As part of this we are seeking the details of individual journeys, including the exact address of where people are travelling to and from. Please complete the questionnaire in relation to the journey you made when you received this form. All information will be treated in the strictest confidence. Thank you for your co-operation and assistance. Should you have any queries regarding the survey please contact **Mott MacDonald Ltd, Tel 0121 237 4002.**

Q1a Please provide the full address [including postcode] that you drove from prior to parking your vehicle?

Address ……

……

…… Postcode ☐☐☐☐☐☐☐

Q1b What time did you park your vehicle? ☐☐☐☐ *AM /PM*

Q1c Number of occupants in the vehicle? *(Including driver)* ☐☐

Q1d Reason for being at the address where you drove from? (*Please tick box)*

1. Home ☐
2. Usual Workplace ☐
3. Employers Business ☐
4. Education ☐
5. Shopping ☐
6. Personal Business ☐
7. Visit Friends ☐
8. Leisure/ Recreation ☐
9. Other (specify) ☐

……..

Q2a How long did it take to drive to the parking facility from the address you were coming from? …….. (Minutes)

Q2b Was this parking facility your first choice for parking in the town centre? ***Yes*** ☐ ***No*** ☐

If NO

(i) Please specify the location where you initially wanted to park your vehicle? ……

(ii) How much extra time did you spent to find the alternative parking *space?* ☐☐ (minutes)

(iii) Please specify the reason for your choice of ***alternative*** parking facility? *(Please tick up to **THREE** boxes if required)*

1. Close to first intended car park ☐
2 Likelihood of finding space ☐
3. Free parking/Low parking fee ☐
4. Length of stay allowed ☐
5. Sheltered car park ☐
6. Safety ☐
7. Cleanliness ☐

Q2c Please specify the reason for your choice of ***FIRST*** intended parking facility? *(Please tick up to **THREE** boxes if required)*

1. Easily accessible on your route ☐
2. Close to your final destination ☐
3. Likelihood of finding space ☐
4. Free parking/Low parking fee ☐
5. Length of stay allowed ☐
6. Safety ☐
7. Sheltered car park ☐
8. Cleanliness ☐

Q2d How often do you come to West Bromwich town centre?

1. Daily / (all weekdays) ☐
2. More than once a week ☐
3. Once a week ☐
4. Two-three times in a month ☐
5. First visit ☐

Q2e How often do you park your vehicle in this parking facility?

1. Every time ☐
2. Whenever space is available ☐
3. When 1st choice parking is not available. ☐
4. Only if no other parking facility is available ☐
5. It was your first visit ☐

Q3a
Please provide the full address of the main destination where you went to, whilst your vehicle was parked

Address……

……

Postcode ☐☐☐☐☐☐☐

Q3b Reason for going there (*Please tick box)*

1. Home ☐
2. Usual Workplace ☐
3. Employers Business ☐
4. Education ☐
5. Shopping ☐
6. Personal Business ☐
7. Visit Friends ☐
8. Leisure/ Recreation ☐
9. Other (specify) ☐

……

Q3c
How did you complete your journey to your destination, after parking your car?

1. Walk ☐
2. Bus ☐
3. Tram ☐
4. Other (specify) ☐

……..

Q3d
How long did it take to reach your final destination from the parking facility?

☐☐ *(minutes)*

Q4a
What time did you drive away from the parking space?

☐☐☐☐

AM /PM

Q4b Please provide the full address [including postcode] that you drove to after leaving the parking space? (**Leave blank if same as *Q1a***)

Address……

……

Postcode ☐☐☐☐☐☐☐

Q4c Reason for going there? *(Please tick box)*

1. Home ☐
2. Usual workplace ☐
3. Employers Business ☐
4. Education ☐
5. Shopping ☐
6. Personal Business ☐
7. Visit Friends ☐
8. Leisure/ Recreation ☐
9. Other (specify) ☐

.....

Q5a *Are you entitled to a disabled car parking space*?

Yes ☐

No ☐

Q5b Are you being reimbursed for the parking cost by your employer, ***OR*** Do you have access to a free parking space ?

Yes ☐ ***No*** ☐

Q5c Do you hold a season ticket for any parking facility in West Bromwich?

Yes ☐ ***No*** ☐

If yes, specify……

Appendix C Survey Responses

C.1 West Bromwich parking Surveys

Total Number of responses: 391

Table C.1: Parking facilities surveyed in West Bromwich

S.No	Car Park	Stay Duration	Capacity
1	Queen Street	Short Stay (2 hrs max)	395
2	Multi Storey	Mixed	845
3	Spon Lane	Short Stay (2 hrs max)	293
4	Oak Road	Long stay	339
5	High Street	Very short stay (0.5 hrs max)	36
6	Council house	Long stay	300

Figure C.2: Reason for being at the origin address (place where coming from)

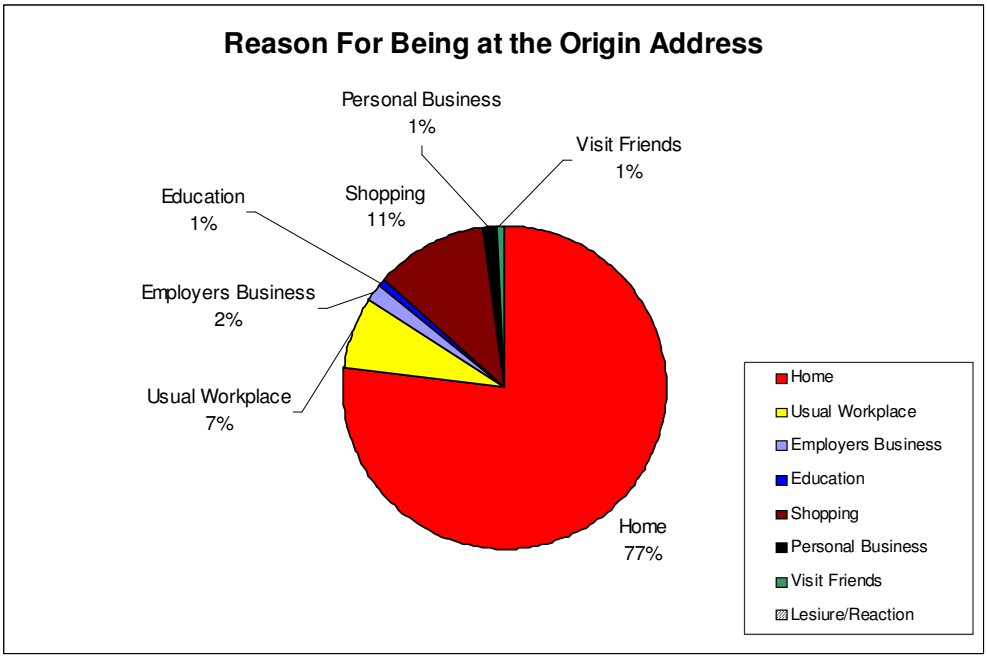


Figure C.3: Number of occupants in the vehicle while parking

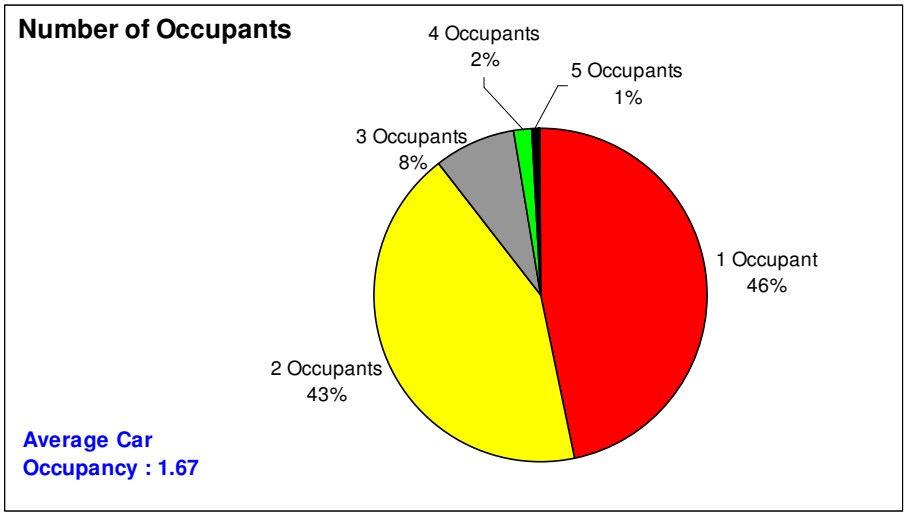


Figure C.4: Trip length distribution for vehicle arriving in the car parks

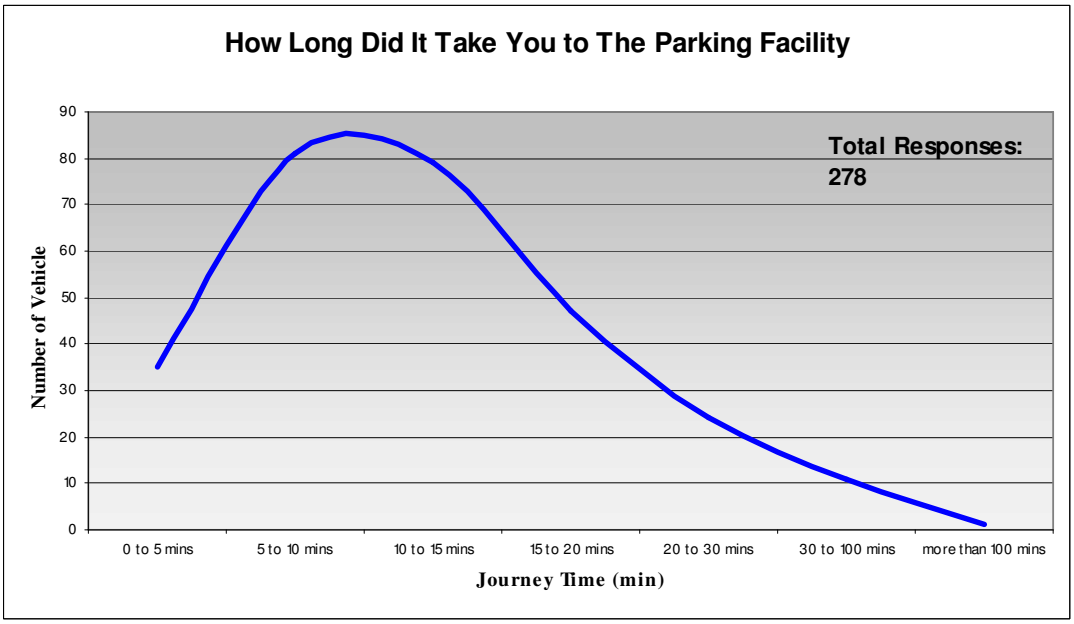


Figure C.5: Reason for choosing the initial car park choice

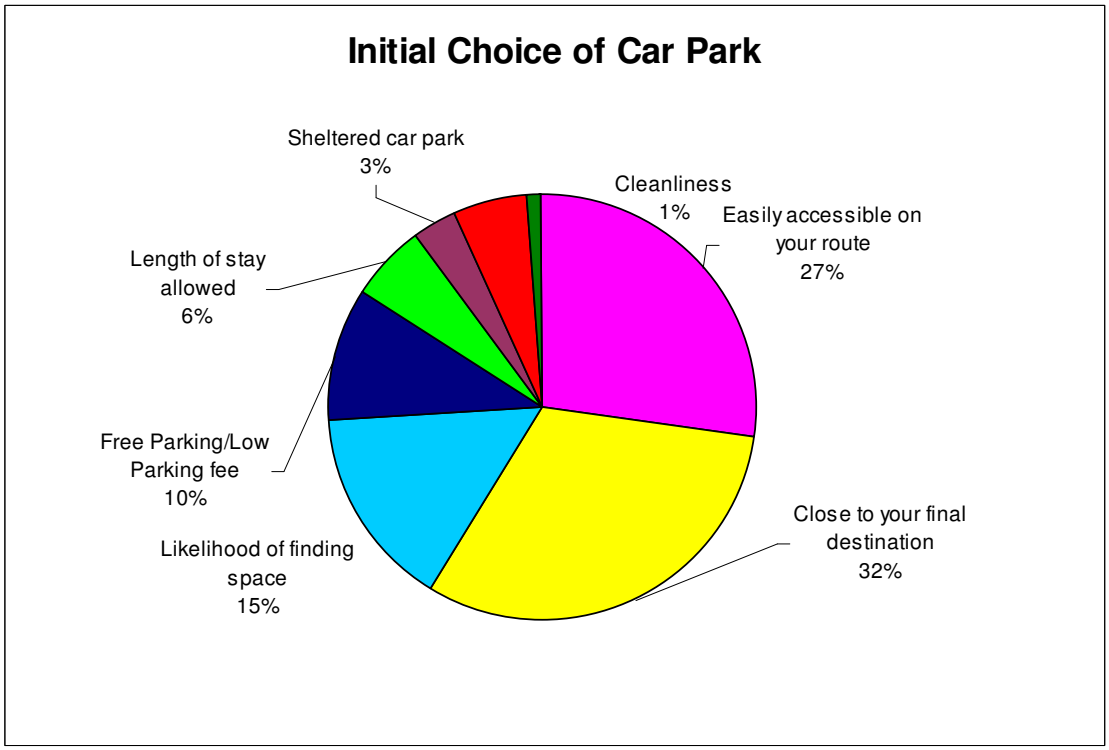


Figure C.6: Availability of initial choice car park

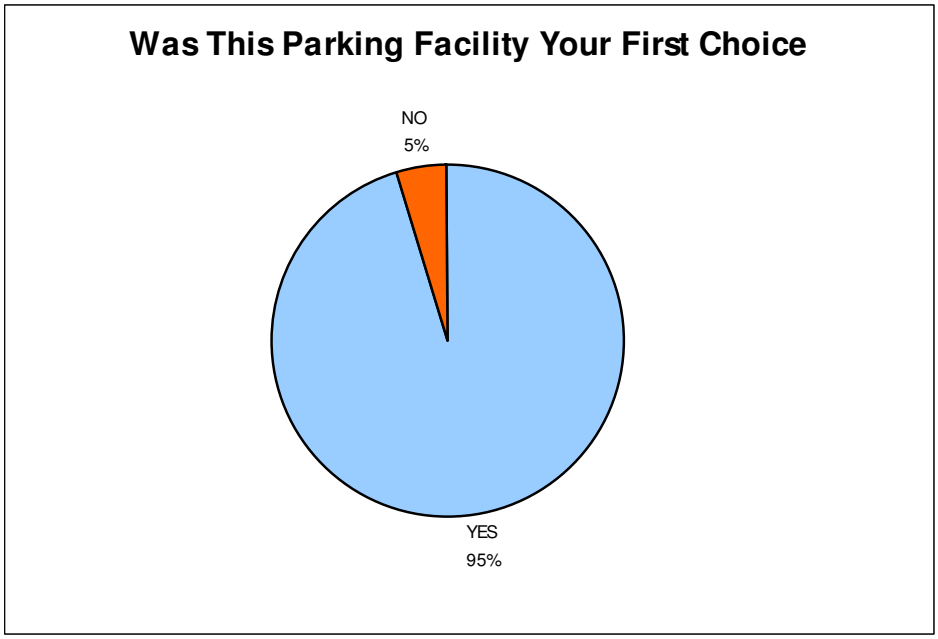


Figure C.7: Factors affecting choice of alternate car park

Figure C.8: Time spent to find alternate car parking facility

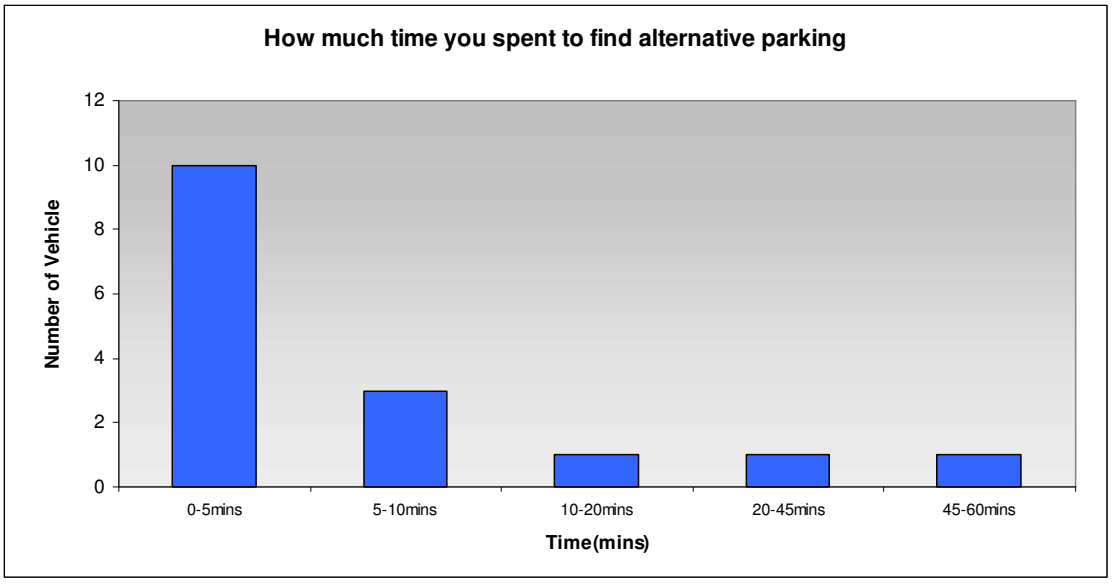


Figure C.9: Familiarity with the study area

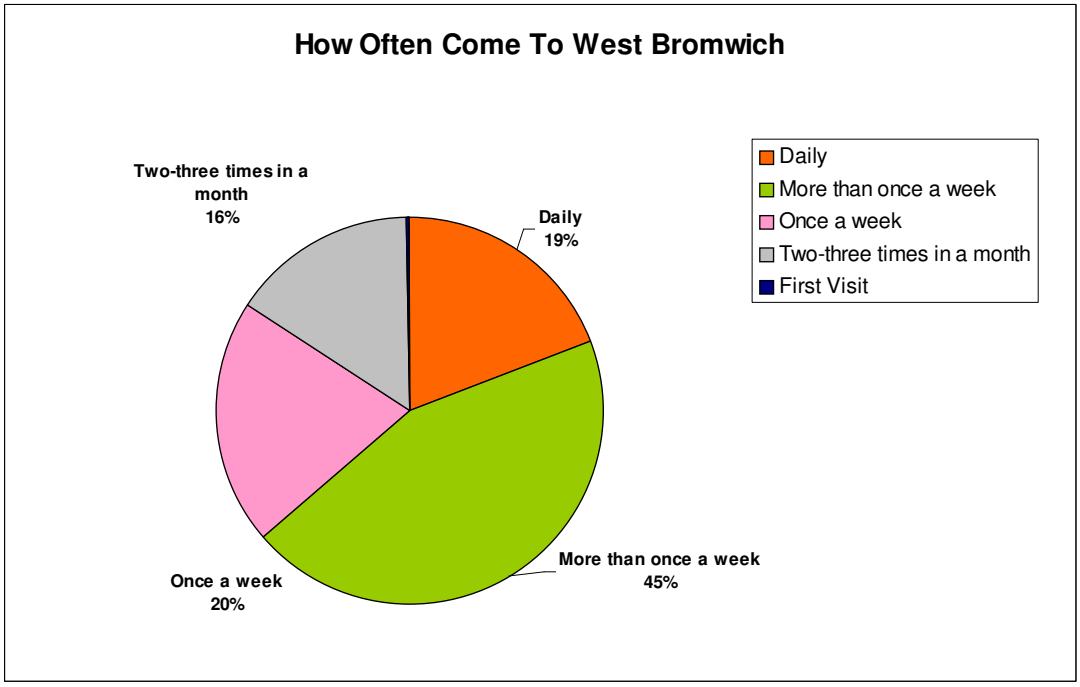


Figure C.10: Familiarity with the West Bromwich town centre car parks

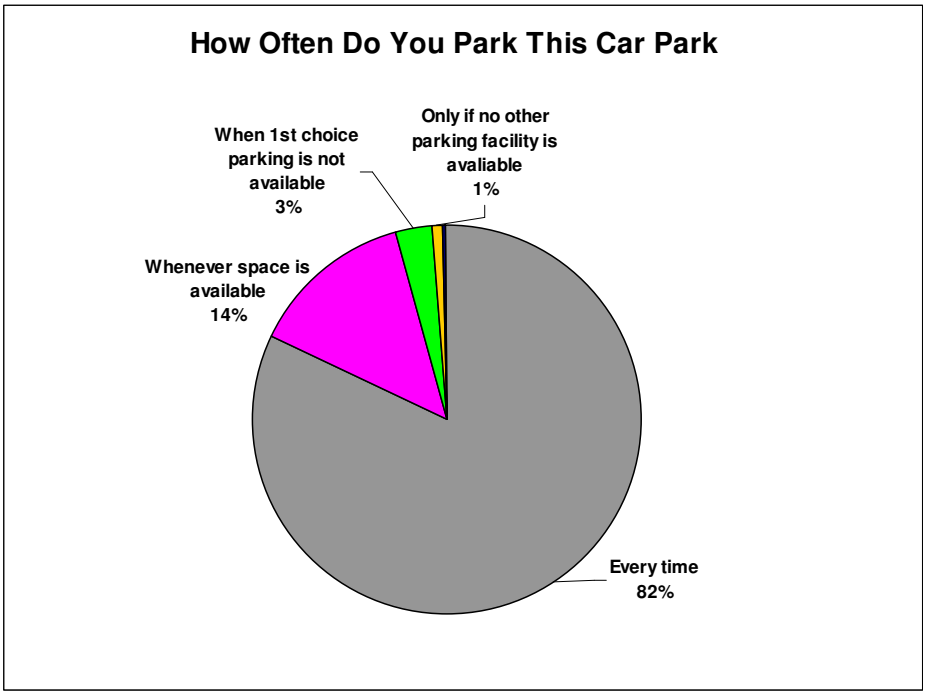


Figure C.11: Reason for coming to West Bromwich

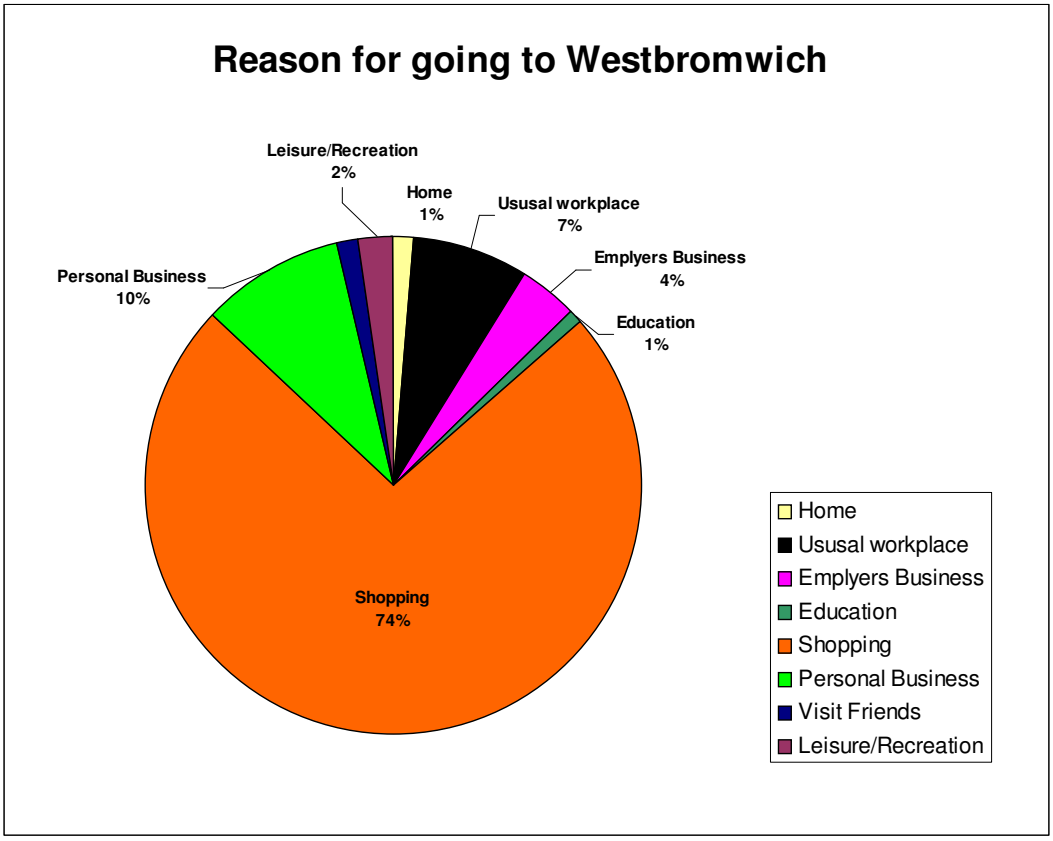


Figure C.12: Length of walking trips from the car parks

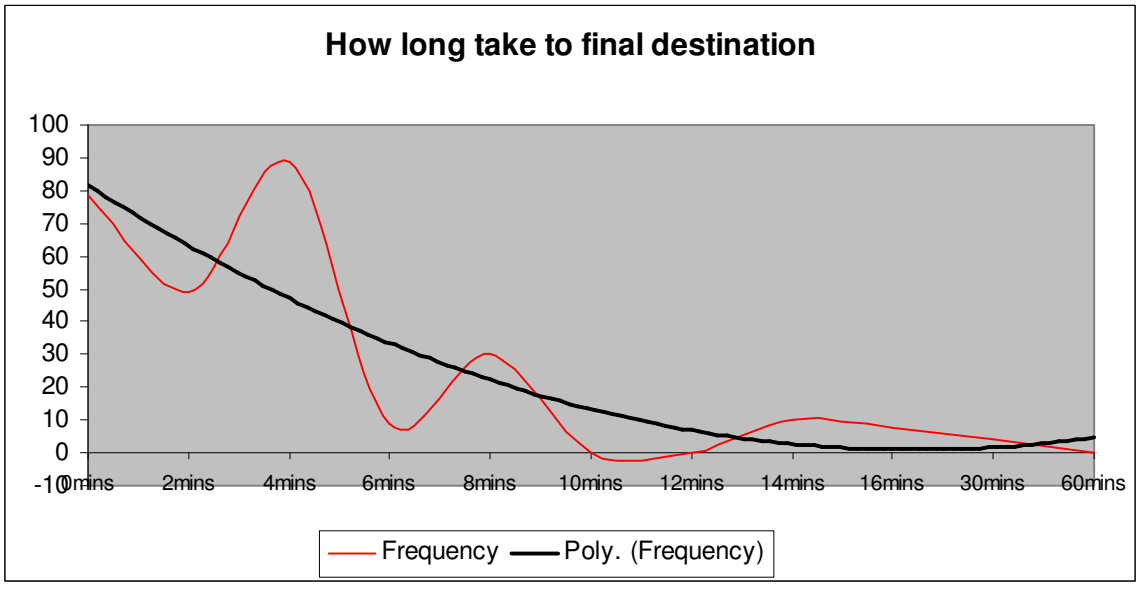
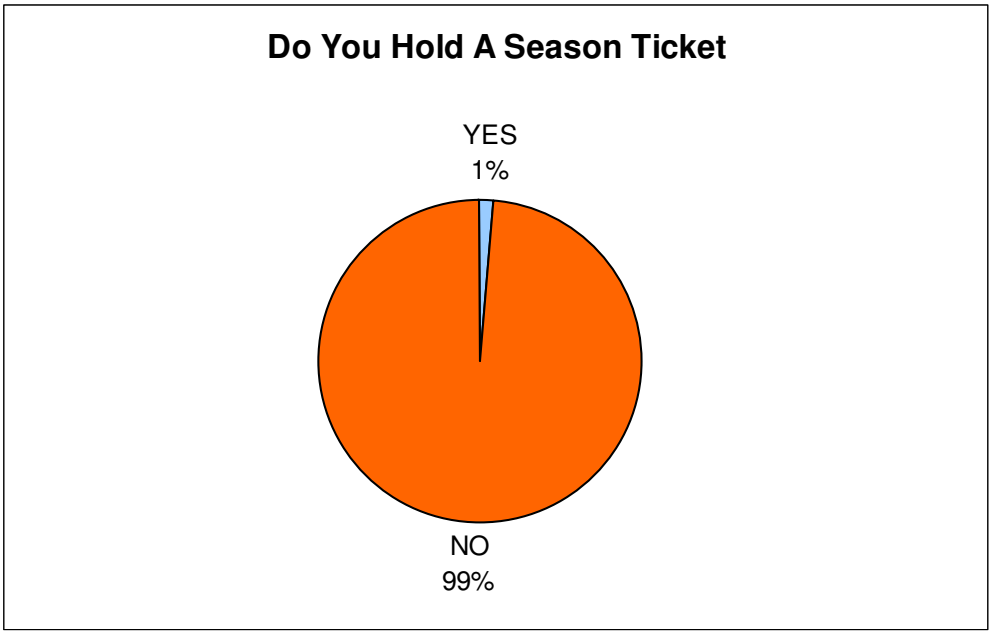


Figure C.13: Season ticket holders



C.2 Sutton Coldfield parking surveys

Total Number of responses: 1026

Table C.2: Parking facilities surveyed in Sutton Coldfield

S.No	Car Park	Stay Duration	capacity
1	Railway Road	Short Stay	200
2	Newhall walk (on-street)	Short Stay	190
3	Gracechurch Mall	Short Stay	240
4	Victoria Road	Short Stay	80
5	Upper Holland	Short Stay	140
6	Station Street	Short Stay	100
7	Lower Reddicroft	Short Stay	120
8	Upper Reddicroft	Short Stay	60
9	Good Hope Hospital	Long stay	450

Figure C.14: Reason for choosing the initial car park choice in Sutton Coldfield

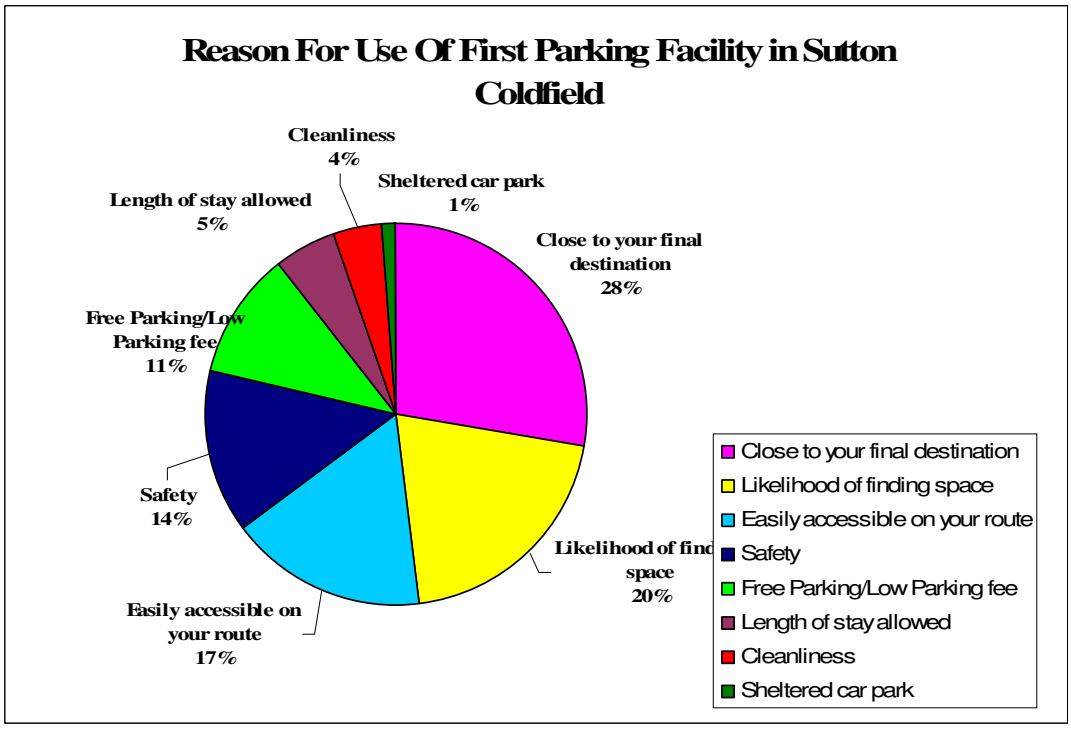
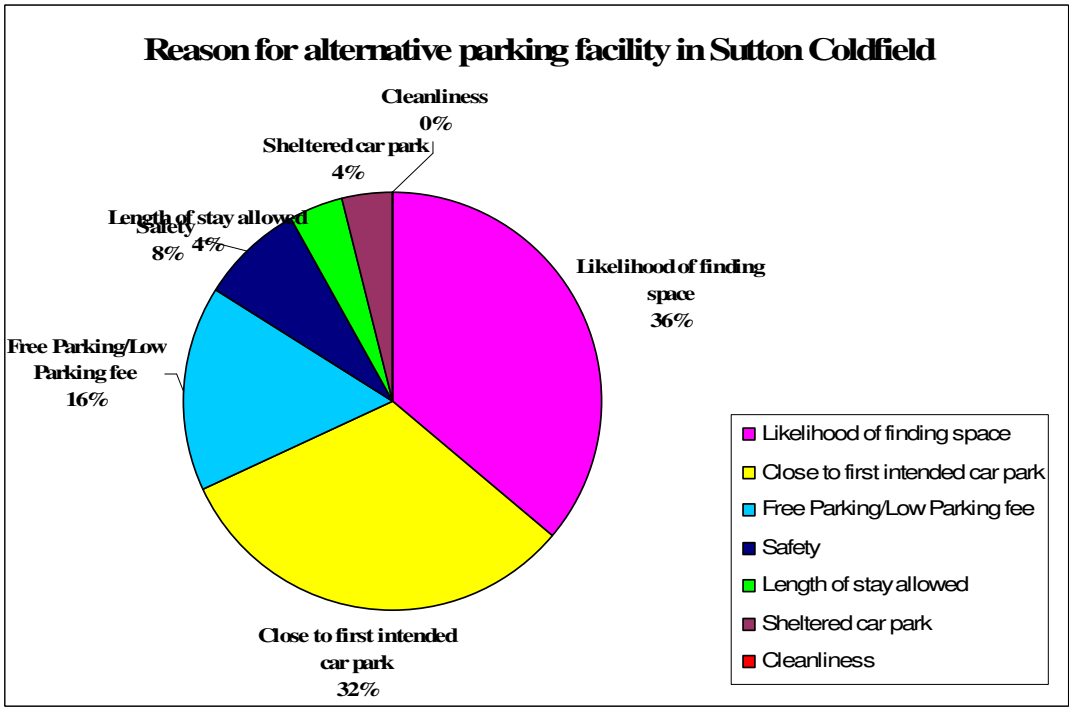


Figure C.15: Factors affecting choice of alternate car park in Sutton Coldfield



List of Tables

List of Figures