Learning (in more ways than one) about the users of Melbourne's off-road bicycle paths

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1 Introduction

Over a number of years, governments have invested in the development of bicycle lanes and paths. The increasing interest in sustainable transport is focusing greater attention on the importance of cycling and adequate data is vital to inform decision making about further development of bicycle facilities.

To assist in understanding the level and trends in use of bicycle facilities in Melbourne, Vic Roads recently installed automatic counting equipment at selected locations on the Melbourne bicycle network. This comprises inductive loops and recording equipment. While the inductive loops have been installed at 17 sites, the permanent recording equipment has been limited to a subset of 12 of those sites which are listed in Table 1 and shown in Figure 1. The automatic counters provide 15 minute aggregate two-way counts of the number of bicycles using the facility. While this data will provide important insight into aggregate use it will leave important questions unanswered. To what degree are these facilities being used for 'transportation' as opposed to 'recreation'? Where are people travelling to and from? What are the socio-demographic characteristics of users? How important are the facilities in cyclists' travel decisions? The project reported here was established to help answer these questions by learning more about the users of Melbourne's off-road bicycle paths. However the 'learning' which was achieved went deeper than just the insight provided by the survey results.

Table 1: List of Automatic Counter Locations

Site	Trail Name	Distance to Melbourne Town Hall (km)
1	Anniversary Trail	8.3
3	Main Yarra Trail No. 1	5
4	Main Yarra Trail No 2 "Koonung Trail"	12.2
5	North Bank	2
6	South Bank	2
7	Canning Street	2.6
8	Upfield Railway Line	4.2
9	Capital City Trail	3.7
10	Footscray Road "Capital City Trail"	3.7
11	St Georges Road	5.4
16	Tram 109 Trail	2.5
17	Bay Trail in	5.4

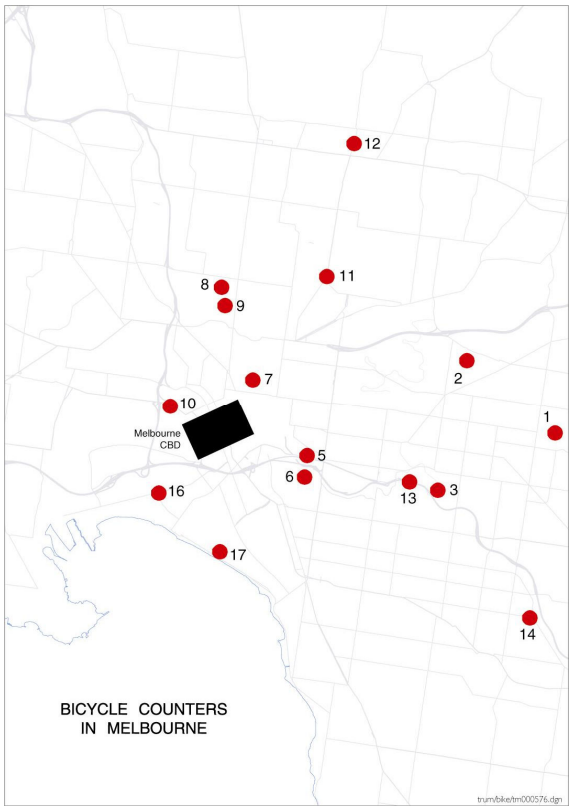

Figure 1: Survey Locations
(Source: Vic Roads)

The project formed an integral part of a final year elective in Transport Planning offered as part of the Bachelor of Civil Engineering degree at Monash University. The class project demonstrated the potential for teaching and research to go hand in hand. The project increased student's awareness of issues in sustainable transport and also developed their skills in the planning, execution and analysis of transport surveys.

The structure of this paper is as follows. Section 2 outlines the project as structured from the student's perspective. That is followed in Section 3 by a description of the survey methodology. The performance of the field data collection system is assessed in Section 4. Insight provided by the survey is discussed in Section 5. Finally the conclusions and research directions are presented in Section 6.

2 The project as the students saw it

The approach taken in the design of the project was similar to that adopted over many years in the projects designed for this and other transport units at Monash University. Termed 'Simulated Consulting' by Rose (2000), the process involves engaging the students in the entire transport survey process from preliminary planning through data collection, data coding, editing and analysis (Richardson et al, 1995) and setting the project in a context where the students are exposed to a real 'client'.

The project was structured in four phases:
Phase 1: Preliminary Planning
Phase 2: Data collection
Phase 3: Coding and sharing the data

Phase 4: Analysis and reporting

Students worked independently in teams of two or three in Phases 1 and 4 while all teams cooperated in Phases 2 and 3.

The project began with the students being given a brief which provided the background on the automatic data collection system installed by VicRoads (as per the Introduction in this paper). That initial brief identified the objectives for the student's project as being to:

- develop a survey methodology to collect rich user data at locations near to where automatic bicycle count data is already being collected,
- draft all data collection instruments to be used in the survey,
- draft instructions for field staff,
- undertake a risk assessment, and recommend appropriate risk control procedures, for undertaking the necessary field data collection.

To reflect a realistic real-world setting, an unrealistic set of expectations about the richness of the data which was required was given to the students. They were informed that the client specifically wanted the survey to provide information on:

- Travel behaviour of cyclists, specifically, trip purpose, origin and destination, frequency of use (perhaps over a one week period),
- Socio-demographic characteristics including occupation, age, gender and level of cycling experience,
- Directional counts (of both cyclists and pedestrians),
- Helmet wearing rates and the type of bicycle being ridden (road, hybrid, mountain etc.),
- Group size (while this may be less of an issue for commuters the survey may be run on a future occasion on a weekend, when groups may be more common, and so the methodology needed to be able to collect that information),
- Factors influencing route choice and in particular, the importance of the infrastructure on route choice. For example if this facility was not available for their current trip, would users still ride, would their route change or would they change their mode of transport?

A key component of their Phase 1 group submission was an articulation of the methodology they proposed to collect the data. Each team submitted a Phase 1 report which addressed the key deliverables identified above. Detailed feedback enabled the students to appreciate the strengths and weaknesses of their proposals. The students were also able to compare their proposals with the methodology finally adopted for the survey. This stage consolidated the theory on survey planning covered in class and enabled the students to develop and reflect on their skill in applying that theoretical knowledge to the design of a survey to meet the requirements of a client.

While the students were undertaking the Phase 1 component the unit lecturer (Geoff Rose) was developing the actual survey methodology which would be used for field data collection. Following the submission of the students reports for Phase 1, they were informed (through a comprehensive briefing session) about the methodology to be employed in the study. The briefing session covered not only details of the methodology to be followed in the field but also safe work practices and actions to be taken in case of problems or emergencies.

The students were allocated to particular sites and on Monday 3 April 2006 all the students participated in conducting the field survey from 7 AM to 10 AM. As detailed in the following section, this involved undertaking tally counts, intercept interviews and distributing reply-paid questionnaires. All groups then assisted in coding the data and the data files were when shared across all groups via the unit web site. The groups then

worked independently on the final phase where they were asked to analyse all the data from the survey (not just the site where they collected data) and prepare a comprehensive report.

The final reports were read by both the unit lecturer (Geoff Rose) and a potential 'client' (Mr Tony Barton, Manager of Bicycle Programs at Vic Roads). This provided an opportunity for the students to gain valuable feedback on their reports – not only in terms of their technical content but also in terms of the effectiveness of their written communication skills. Vic Roads kindly donated a prize for the group which achieved the highest marks in the project.

3 Survey Methodology

The methodology employed in the field data collection was modelled off an approach adopted to understand usage of the Swiss Veloland Cycle Network (Richardson et al, 2000). Specifically the survey involved:

- undertaking a tally count near to the automatic counting equipment installed by Vic Roads, and
- intercepting cyclists to ask them three brief questions, recording that data on a field sheet, and then handing them a questionnaire which they were asked to complete and return via reply-paid post.

Figure 2 shows one of the survey sites in operation. The inductive loop detectors and the automatic data recording cabinet are distinguishable in the foreground of the figure. This was one of the busiest sites on the morning of the survey with about 200 cyclists per hour passing this point. Efforts were made to match the number of field staff to the anticipated workload at each site. The students on the left of the path in Figure 2 were undertaking an independent tally count of all path users. The students on the right were conducting the intercept surveys and distributing the self-completion questionnaires to those cyclists who were intercepted. The student towards the rear of the photo, facing towards the approaching cyclists, was giving approaching cyclists a verbal warning that they were approaching a survey point.

Figure 2: Field Survey Data Collection

The tally counts were conducted close to the Vic Roads loops because the data will later be used to access the accuracy of the automatic counts. The tally count form required the field staff to distinguish the direction of travel, whether the user was a pedestrian or a cyclist and for the cyclists, their gender and whether or not they were wearing a helmet. This tally count data provides insight into the 'population' and is very important for establishing the representativeness of the data collected in the intercept surveys. Tally count data was recorded manually on a field sheet designed specifically for each survey location.

Conducting the intercept survey was more challenging than doing the tally counts. The intercept survey involved:

- Selecting a sample of cyclists who were to be asked to complete the intercept survey,
- Conducting the intercept survey and recording relevant data on an 'Intercept Interview Control Sheet' and then
- Asking the intercepted cyclist to complete and return a self completion questionnaire.

It was critically important that a random sample of cyclists be approached for the intercept interview or there was a risk of interviewer bias affecting the results. The absence of a sampling frame meant that systematic sampling had to be employed. The aim was a 25 per cent sample, so that every 4th cyclist was to be approached for the intercept survey.

Each cyclist who was stoped was asked three short questions:

- the suburb/postcode of their origin,
- the suburb/postcode of their destination, and
- the purpose of their trip.

In addition, the time when the intercept interview was conducted was recorded along with the gender and estimated age of the cyclist and whether they were riding alone or in a group. This information was important in understanding not only who accepted an interview but also in assessing the representativeness of the questionnaires which were ultimately returned. The number of the questionnaire handed to each intercepted cyclist was also recorded on the Intercept Survey Control Sheet.

The self-completion questionnaire was anonymous and included a reply-paid return envelope. The questionnaire included 15 questions which covered:

- Origin and destination
- Trip purpose
- Riding time and distance including the time spent on different types of facilities
- Riding behaviour over the previous week
- Factors which influence route choice
- Travel behaviour if the off-road path was not available, and
- Socio-demographic information (age, gender, riding experience and primary purposes of cycling).

The combination of the tally counts, intercept surveys and questionnaires provided a rich set of data. Because of the fixed semester duration, the students were only able to analyse the questionnaires received in the week following the survey. In this paper the complete set of returned surveys is analysed. In the space limitations of this paper it is not possible to examine all of the dimensions of the data but a number of key results are described in the following sections.

4 Performance of the field data collection system

Before examining the results of the survey it is appropriate to assess the performance of the field data collection system. Key considerations here are the extent to which the methodology ran smoothly in the field, whether it delivered the required quantity and quality of data and whether the responses are representative of the population. We will consider not only aggregate results but also some statistics for individual sites since these highlight issues which arose at particular locations.

Over the three hour duration of the survey (7 AM to 10 AM) a total of 4342 cyclists were observed in the tally count. Of these a total of 618 intercept interviews were successfully completed representing a sampling rate of 14.2 per cent (a one in 7 sample). This was short of the one in four sampling target which would have required a total of 1086 intercept interviews. Figure 3 shows the total tally count of cyclists at each site and the number of intercept interviews which were successfully conducted. This figure also highlights the target which was set to conduct the intercept survey with one in four of the passing cyclists (a 25 per cent sampling rate).

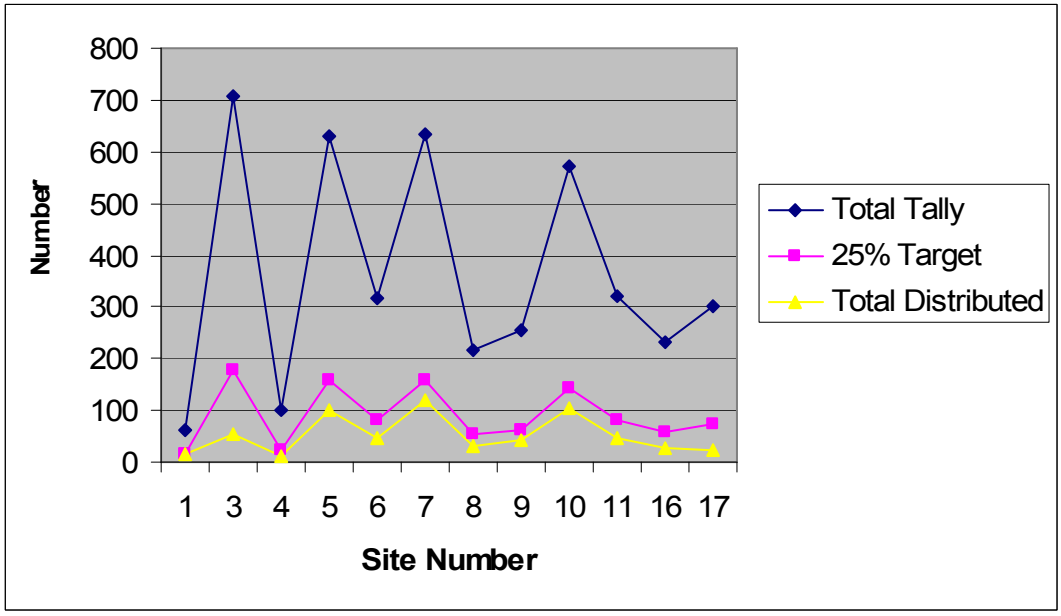

Figure 3: Site by site count results over the three hour survey period

Figure 3 highlights the sites fell into three groups in terms of usage: Low usage with about 33 cyclists per hour (Sites 1 and 3), Medium usage with about 100 cyclists per hour (Sites 6, 8, 9, 11, 16 and 17) and High usage with about 200 cyclists per hour (Sites 3, 5 and 7). Only at the low usage sites was the 25 per cent target sampling rate achieved. The biggest difference between the target and the number of questionnaires actually distributed occurred at site 3. The challenge here was getting cyclists to stop for the intercept survey. Most cyclists approached the site at speed, thanks to the downhill grade which followed a bridge across the Yarra River. Cyclists were reluctant to stop for the intercept interview and on a number of occasions cyclists rode past and then stopped further along the path, turned around and returned to participate. Advance warning signs or perhaps completing the intercepts prior to the downgrade could be considered in future surveys. At some sites the trail crossed a road adjacent to the survey site and this provided an ideal opportunity to conduct the intercept surveys since the cyclists often had to stop to cross the road.

The one in four sampling rate was initially set in the hope of achieving an adequate number of returned questionnaires. It was difficult to assess the likely response rate to the

questionnaire. Richardson et al (2000), in the context of the Swiss Veloland Cycle Network surveys, reported a range in response rate from 11 per to 75 per cent across the sites, with an overall response rate of about 43 per cent. Against those benchmarks, the overall response rate of 77 per cent for the Melbourne self-completion questionnaire was very encouraging and puts it towards the high end of response rates which could be expected from a self completion travel survey (Richardson et al, 1995).

There was a variation in the response across sites as illustrated in Figure 4 although there were no sites where extremely low response rates were achieved. The lowest response rate (at about 60 percent) was for site 11 where there was a higher proportion of younger riders since the off-road path provided access to a nearby high school. The highest response rate of 90 per cent was reported for the main Bay Trail in St Kilda. The high overall response rate of 77 per cent may reflect the level of interest that the respondents had in the focus of the study and also the personal distribution of the survey instrument.

Figure 5 highlights that the response rate for males was slightly higher than for females. However, the 70 per cent response rate for females is still high by the standards of self-completion questionnaires.

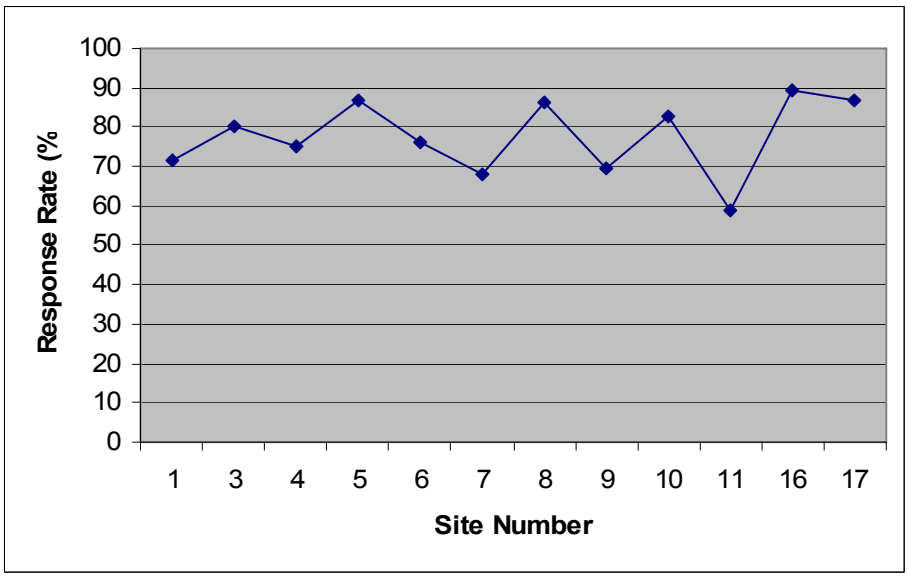

Figure 4: Questionnaire response rate by site

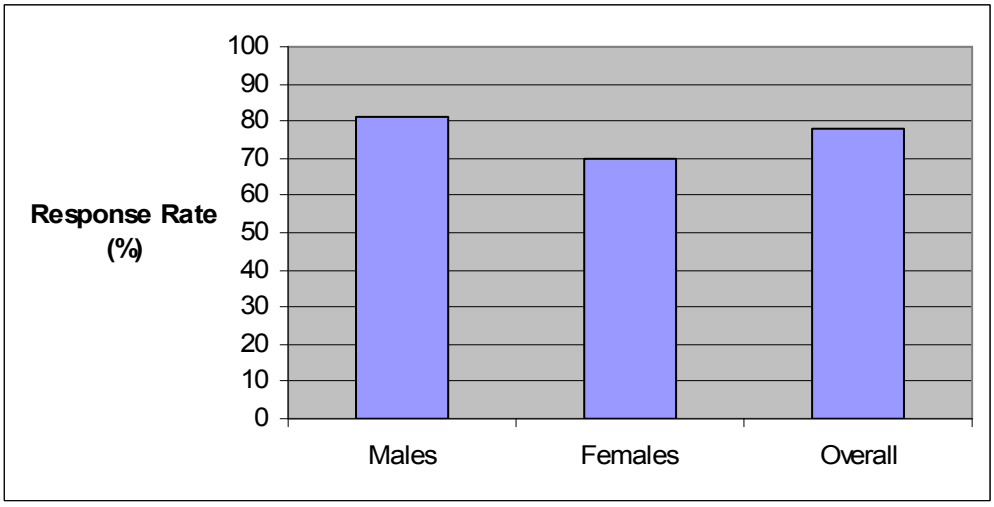

Figure 5: Gender specific and overall response rates

Apart from knowing the response rate by gender, it is also of interest to know whether the responses are representative of the population of riders using the facilities at the time the survey was conducted. Both the tally counts and the intercept interviews recorded gender and so the gender balance in each component of the data collection can be compared.

Figure 6 shows the gender balance in the results of the tally count, intercept interview and questionnaire responses. The 73%/27% male/female distribution in the returned questionnaires exactly matches the gender distribution observed in the tally count. The intercept survey process slightly over sampled females but their lower response rate meant that the final results can be regarded with some confidence as reflecting the gender balance of the population at the time the survey was undertaken. These results are consistent with data published by Vic Roads (1999) which reports that about 75 per cent of cyclists in Melbourne are male.

Overall the field data collection system proved itself as delivering high quality and a considerable quantity of data. The following section identifies some of the insight provided by the survey responses.

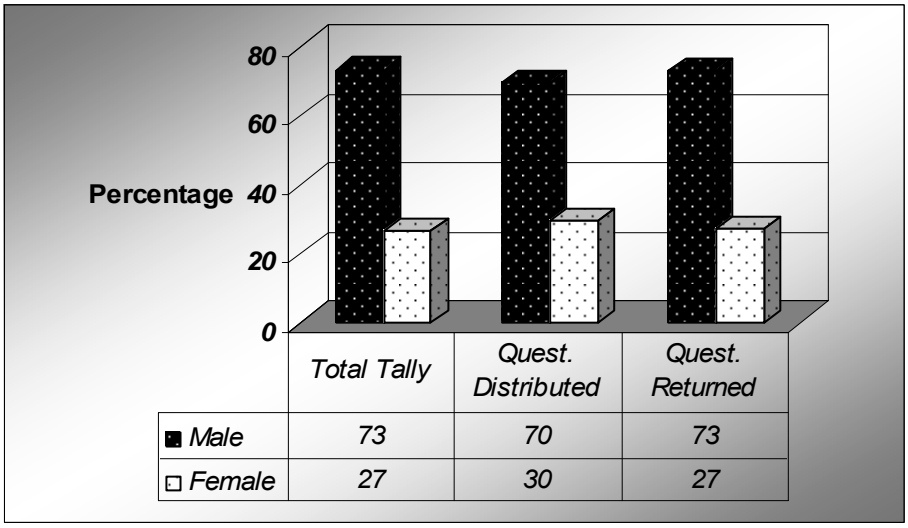

Figure 6: Gender splits across data collection waves

5 Insight from the survey data

The questionnaire provided very rich information on the behaviour of cyclists using Melbourne's off-road paths. The discussion here focuses on a few key dimensions of the data.

Trip purpose is important when seeking to understand the usage of facilities. As highlighted by Figure 7 the vast majority of the trips (about 85 per cent) were for commuting to work. The next most important purpose was recreation which accounted for about 8 per cent of all trips. Given that many of the locations were on radial arteries focussed on the central business district this result is not surprising. It does however highlight that these off-road facilities are being used predominantly for ulititarian cycling. This is important in understanding the role of these facilities within the transportation system. Consistent with other components of the transportation system at the time when the survey was conducted, this infrastructure is being used for 'transportation' rather than 'recreation'.

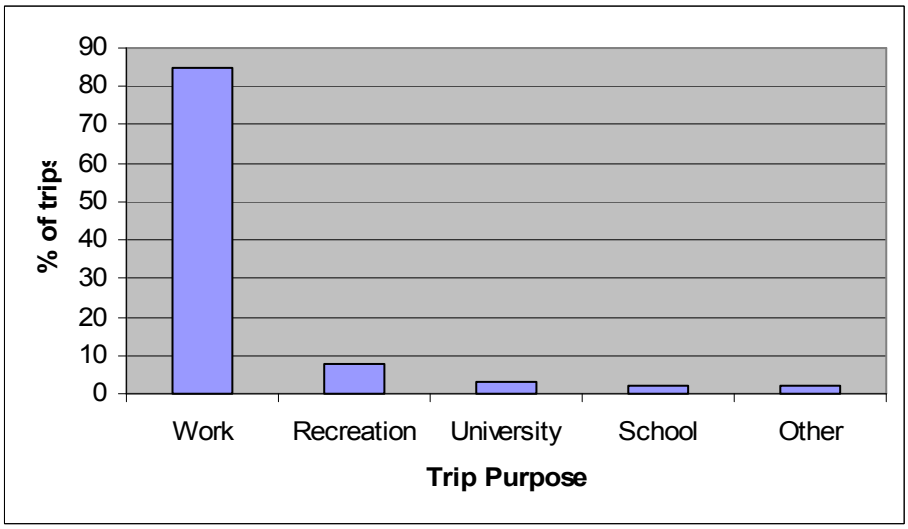

Figure 7: Trip purpose distribution

In addition to knowing the purpose of trips the length of those trips is also of interest. The distribution of riding time is shown in Figure 8. The mean total riding time was 36 mins with a standard deviation of 20 mins. This highlights that the majority of trips are in the 15 to 45 minute range. Recreation trips, particularly those being undertaken primarily for exercise, are commonly associated with the longer riding times.

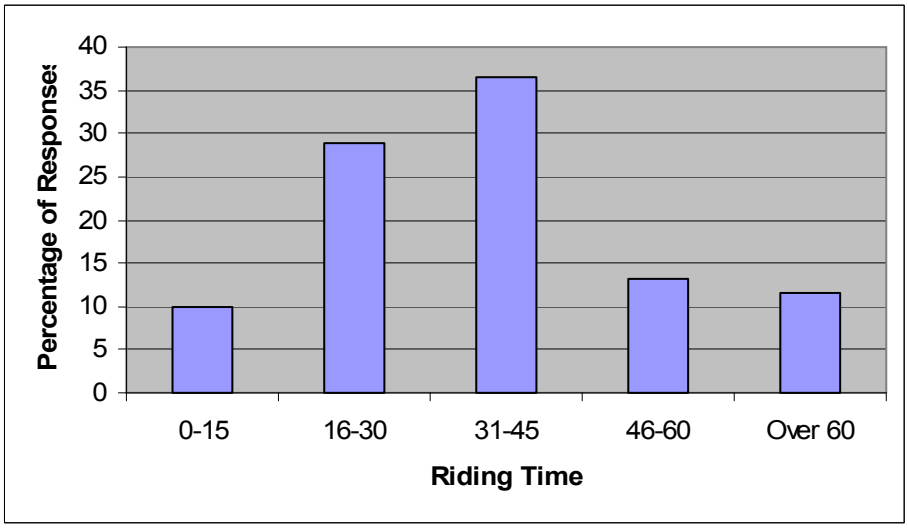

Figure 8: Riding Time Distribution

On average users spent 53 per cent of their trip on off-road facilities although there was considerable spread in this proportion as shown in Figure 9. For nearly one in five of those surveyed the vast majority of their trip (in excess of 80 per cent) was undertaken on off-road facilities.

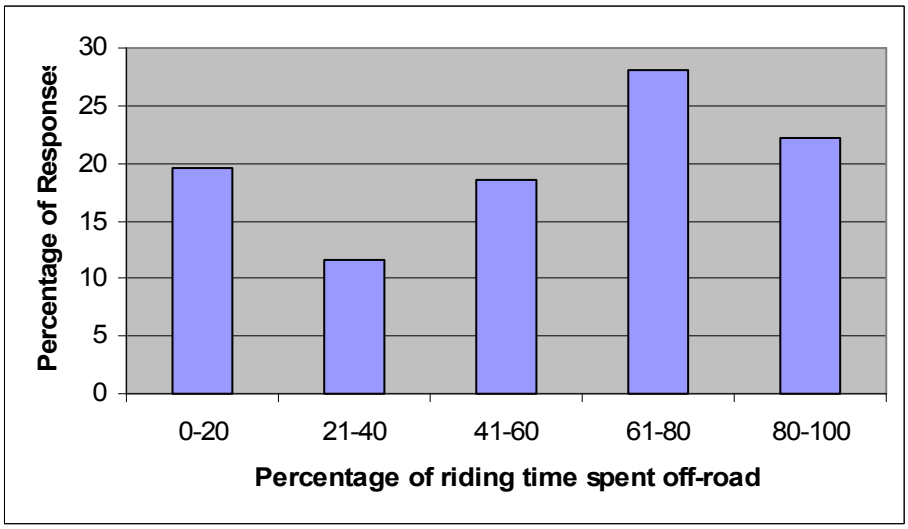

Figure 9: Distribution of percentage of riding time spent off-road

In the self-completion questionnaire, respondents were asked about how their travel behaviour would change if the bicycle path/facility where they were riding had not been built. Figure 10 highlights that nearly 80 per cent of riders indicated that they would still ride. Of them 95 per cent (that is, 75 of the 79 per cent who would still ride) said they would change route while only 5 per cent (that is, 4 of the 79 per cent who would still ride) indicated they would change destination. One in five riders (20 per cent) indicated they would change mode if the facility was not available. Of those who would change to travel by car, the vast majority (88 per cent or 7 of the 8 per cent who would switch to car) would become a car driver with the remainder changing to be a car passenger. Approximately one in eight (12 per cent) of the respondents indicated that public transport would be their preferred travel alternative if the bicycle facility was not available. Only a very small proportion (1 per cent) indicated they would not make the trip if the facility was not available.

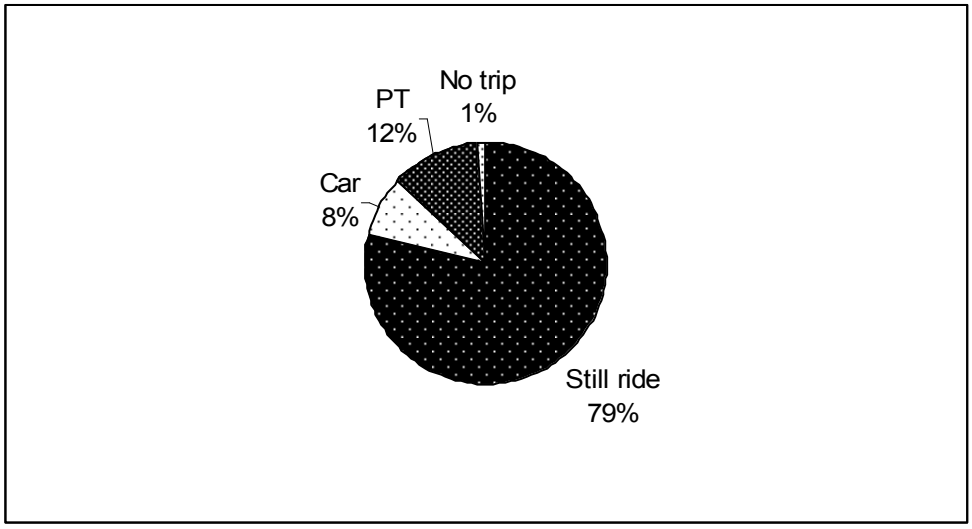

Figure 10: Travel behaviour if the bicycle facility had not been built

These results highlight the role which bicycle facilities play in moderating demand for motorised transport options, particularly during a peak commuting period. However, this issue may be worthy of further, more detailed examination. Cyclists may have overestimated their willingness to continue to ride if the off-road bicycle facility was not available. In most cases the alternative route would not provide as comfortable or perhaps as safe a riding

experience as the off-road path. It is possible that respondents did not consider their alternative route in detail before indicating that they would continue to ride if the off-road facility was no longer available.

6 Conclusions and Research Directions

This project provided a rich setting for students to experience the transition from theory to practice in relation to transport surveys. The four phase structure of the student project provided engagement in the entire transport survey process from preliminary planning through data collection, data coding, editing, analysis and reporting. Not only have the students learned a great deal about conducting transport surveys and the relevance of cycling in the context of sustainable transport but the whole process has provided valuable insight which will provide a basis for more inform decisions about further development of bicycle facilities.

A combination of tally, intercept and self-completion surveys was found to provide detailed information on the users of Melbourne's bicycle facilities. The survey methodology was able to deliver not only high quality data (in terms of its representativeness of the underlying population) but also a substantial quantity of data, thanks to the very high response rate. Were the survey to be repeated in future then consideration could be given to the locations where the intercept surveys were undertaken. Locations would ideally be selected where cyclists were slowing, rather than accelerating as a result of favourable downhill grades, to increase the rate for successful completion of the intercept surveys. The overall response rate of 77 per cent for the self-completion surveys is very high. This possible reflects the extent to which the survey resonated with the respondents and also the engagement produced by hand delivering the questionnaire.

The data obtained from the self-completion questionnaire was found to exactly match the tally counts in terms of gender split. While the intercept interviews slightly over-sampled females, their slightly lower response rate compensated to produce a representative sample.

Analysis of the questionnaire survey data highlighted that the vast majority of trips (85 per cent) in the 7 to 10 AM time period were for commuting to work with recreational use accounting for approximately an order of magnitude less (8 per cent of all trips). On average cyclists spent 36 minutes on their ride with over 50 per cent of that time spent on off-road facilities. If the off-road facilities were not available, approximately one in five (20 per cent) of riders would change modes. A slight majority (60 per cent) of those would turn to public transport as opposed to public transport to complete their trip. These results highlight the role which bicycle facilities play in moderating demand for motorised transport options particularly during the peak commuting period.

This paper reports only the initial analysis of the data. Subsequent analysis will examine the data in more detail including statistical analysis of the differences in behaviour of male versus female cyclists and further examination of the factors influencing cyclist route choice behaviour.

7 References

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8 Acknowledgements

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