U-PASS AND T-CARD REPURCHASES: IMPACT ON FINANCIAL STANDING OF UTM STUDENTS

1. Introduction and Motivation

In an era of ever-rising tuition fees, costs of university textbooks, and the general costs of living, the average student enrolled in a Canadian undergraduate program is faced with a financial struggle. At the University of Toronto Mississauga campus (UTM), this struggle is amplified by the replacement costs that some students have to bear when having to repurchase a T-Card (UofT identity card) or the Mississauga Transit U-Pass (a transit card that allows unlimited trips on the Mississauga transit system during the designated period of study). In the year 2016, the cost to replace the U-Pass is significantly higher than the cost to replace a T-Card; with the cost of replacing a U-Pass being either $60 for the summer term, or $100 for the fall/winter term, while T-Card replacements have a fixed price of as little as 12 dollars per card. With that being said, losing a U-Pass can have a substantial impact on the budget of some students.

This project focuses on studying the correlation between the amount of T-Cards to U-Passes lost by UTM students, with the motive of drawing conclusions to the overall financial effect on the UTM student population. These inferences can be used to reduce the amount of student funds spent inefficiently.

2. Survey Methodology

The data was obtained through an in-house developed online survey web application which was tailored particularly for this project. This application allowed the entered information to be automatically saved into a csv (Comma Separated Value) file that was later to be utilized for analysis purposes. Each sample was chosen and recorded by Systematic Random Sampling during five consecutive days at random times from 10:00 to 20:00 in Davis Building. The required sample size for this project is 400 randomly selected undergraduate UTM students. The systematic interval chosen in the proposal was 35 students, and was calculated by dividing the total UTM population (~14000) by the selected sample size (400). The starting subject's number was 12 and was obtained through the means of the programming environment R.

In regards to the chosen location, the Davis building provides a clear representative sample of the UTM population for a number of reasons. Firstly, the Davis building is in prime position to attract foot traffic from both the UTM Bus Stop and the largest parking garage at UTM. This allows for a more representative sample to be collected because it accounts for undergraduates who drive to school and those who travel by bus. The Davis building is also home to a number of different facilities and student services such as recreational facilities, the Bookstore, Disability Center, International Education Center and the largest food court on campus. Considering that

the sampling units filled out their survey individually, the non-response (empty fields in the csv file) had to be taken into consideration.

3. Obstacles and Limitations

Due to a lack of time and manpower during data collection, instead of surveying every 35th student, a minimum interval of 8 was set. This allowed for data collection deadlines to be met while allowing the data to remain accurate and representative; the odds of having clustered populations were reduced due to the variety of students that enter the Davis Building and the frequency with which they enter the building.
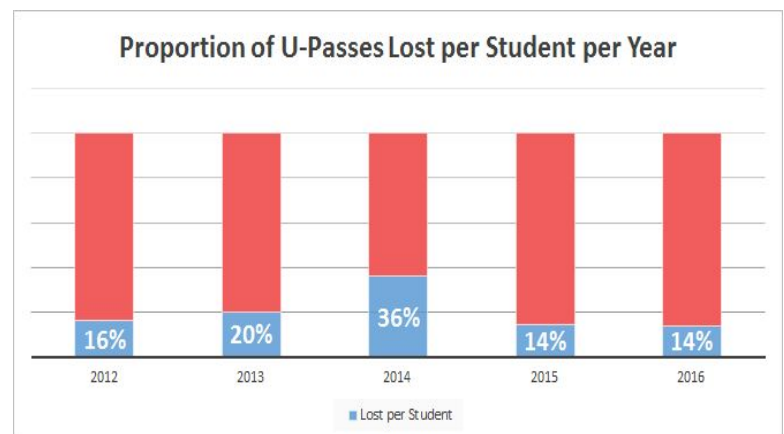
Additionally, the developer of the data collection software had run into roadblocks during the development life-cycle. This resulted in data being collected but not sent to the csv file on the back end. Thus, due to this complication, additional data collection had to be carried out.

Also, sampled students may have misunderstood certain survey questions, such as the meaning of a T-Card or UPASS repurchase. This particular misunderstanding may have resulted in students entering numbers of cards and bus passes that were misplaced, but not re-purchased, thus reducing the accuracy of the data. The survey team was cognisant of this, and attempted to minimize this error by proactively clarifying the survey questions during the data collection process.

Furthermore, students may have re-purchased their UPASS from unofficial sources for different money amounts. As no data on unofficial repurchases of bus passes was available, the team proceeded with the assumption that all bus passes were re-purchased through legitimate channels. This assumption was made based on the premise that students are unlikely to report illegal repurchases of bus passes.

4. Detailed Findings and Results

The regression model attempts to find the relationship between two or more explanatory variables and a response variable by fitting a linear equation to the observed data. The multiple linear regression method has been used in order to estimate the number of T-Cards and U-Passes misplaced or stolen in forthcoming academic years at UTM.

Proportion of U-Passes Lost per Student per Year

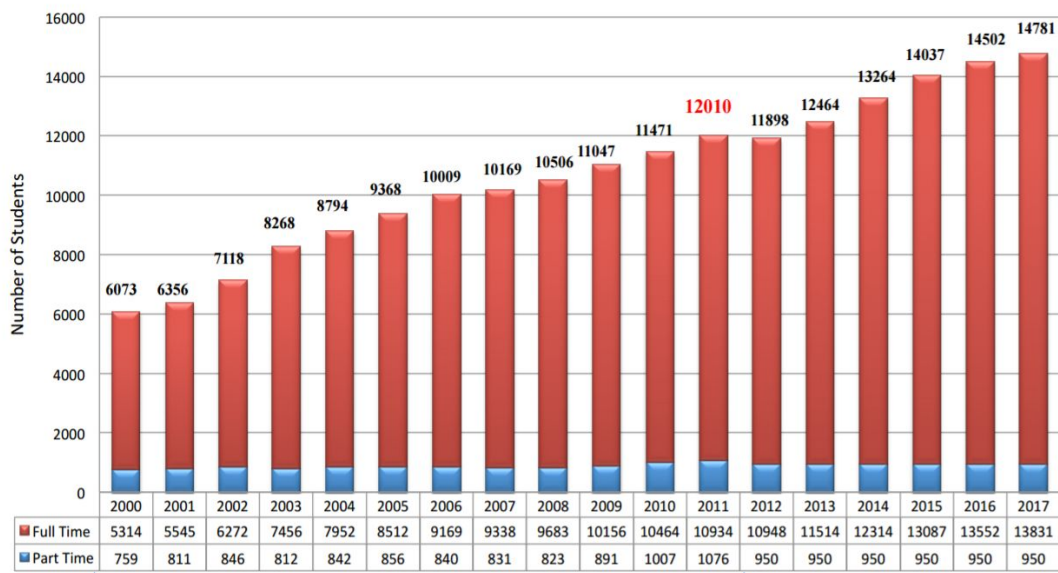| 2012	2013	2014	2015	2016
16%	20%	36%	14%	14%

■ Lost per Student

As per the initial proposal, the bootstrapping technique was supposed to be used. In short, the bootstrapping

technique is useful when the distribution of data is unknown. It allows to generate a large amount of data from the already collected sample in order to predict how accurate it is and whether it is a good representative of a whole population. However in the midst of conducting the analysis, it was discovered that the method does not satisfy our needs, in particular - accountability for non-response, and therefore had to substituted bootstrapping with imputation.

The regression analysis revealed a strong correlation between the number of T-cards lost and the number of U-Passes lost. Therefore, the assumption is made with confidence that the future amount of T-Cards and U-Passes lost will be positively correlated and will correspond to the linear progression of the proportion of T-Cards to U-Passes lost per student per year. It is necessary to note that after plotting the fitted line for both proportions (T-Cards and U-Passes) it was observed that the slopes of these lines were positive. This means that the amount of T-Cards lost and U-Passes lost will be approaching infinity with every subsequent year. Therefore, for the purpose of this project the mean proportion of T-Cards and U-Passes lost per student will be used to estimate our prediction. Graph 3 below represents the expected UTM population over the period from 2012-2017.

University of Toronto Mississauga
Total Headcount 2000-2016 – Actual and Projected

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Full Time	5314	5545	6272	7456	7952	8512	9169	9338	9683	10156	10464	10934	10948	11514	12314	13087	13552	13831
Part Time	759	811	846	812	842	856	840	831	823	891	1007	1076	950	950	950	950	950	950

Totals above bars: 6073, 6356, 7118, 8268, 8794, 9368, 10009, 10169, 10506, 11047, 11471, 12010, 11898, 12464, 13264, 14037, 14502, 14781

As per the graph above, it is predicted that UTM's population in 2017 will be 14781 students. Thus, the calculated expected total amounts of future T-Cards and U-Passes lost in 2017 are 5936 and 3713 respectively.

Taking into consideration the price difference for U-Passes during each term, it is necessary to indicate the proportions lost during Fall-Winter term and Summer term. The results show that 86% of U-Passes were lost during Fall-Winter term and 14% were misplaced during Summer term.

Therefore, based on the percentage mentioned above, the estimated U-Passes lost during Fall-Winter term in 2017 is approximately 3207 while during the Summer term the amount will be approximately 506. Using these results and the appropriate costs of replacement for both these items, the estimated total amount of money spent by future UTM students in 2017 is approximately $422,292.

5. Conclusion

The focus of this project is to analyse and make inferences about funds that are spent on repurchases of U-Passes and T-Cards by UTM students. The data collected from four hundred students shows that there exists a strong correlation between T-Cards lost and U-Passes lost. This correlation analysis allows us to draw an inference about expected future funds to be spent. After running the regression analysis and determining the appropriate proportion values, it is estimated that UTM students will spend over four hundred thousand dollars during the 2017 study year.

It is important to note that the results of this study are limited by imposed deadlines, a lack of resources such as manpower, and other previously outlined impediments. Further studies could be devoid of such limitations and shed more light on the true amount of money spent by students repurchases of T-Cards and U-Passes. Therefore there is room to implement and improve administrative policies that would benefit students in the long run. ie; microchips within T-Cards that can be encoded with transit status data, or transit stickers on student cards.