

An Investigation into the Application and Environmental Impact of the UBC Mugshare Program

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University of British Columbia

APSC 262

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Source: Thermos

<http://www.thermos.com/imgs/product_imgs/NS100BK004_Thumb.png>

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An Investigation into the Application and Environmental Impact of the UBC Mugshare Program

A Formal Report

Submitted to
Doctor Michael Hitch

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Technology and Society II

Submitted by
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ABSTRACT

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In order to evaluate the viability of the Mugshare program at the University of British Columbia's Vancouver campus, the program should be analysed using a triple bottom line assessment involving environmental, social, and economical factors. The scope of this report is analyzing the public awareness of the program, the economic feasibility of the current deposit, and environmental impacts of using reusable stainless steel mugs. The methods used in this analysis are gathered from academic articles, and trusted web resources.

The topics mentioned above are examined in detail, with a slight emphasis on evaluating the presently used stainless steel mugs. The goal of the Mugshare program is to reduce the waste created on campus by the incorrect disposal of single-use paper cups. Currently, the Mugshare program seeks to do this by lending out 14 ounce reusable stainless steel mugs with a five dollar deposit. Stainless steel mugs are presently the best option for such a program, with long-term durability and little to no long-term adverse health hazards, however, the high energy consumption and emissions associated with production make it necessary to examine alternatives to ensure this is the best choice for the Mugshare program.

If stainless steel mugs will continue being used by the Mugshare program, the cost, design, and monitoring will need to be improved to further benefit the program. Currently, the deposit to participate in the program is five dollars, however if the program is going to continue to be economically feasible, such a deposit should be raised. On a related note, the design of the mug currently incorporates a rubber bottom, with a plastic lining. Such lining and rubber bottom should be removed to reduce the deterioration of the mug. A potential issue for the Mugshare program is the monitoring and tracking of the mugs. Efficient tracking methods such as implementing a barcode into the design of the mug, and linking said barcode to UBC student cards are outlined in this report.

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GLOSSARY

| | |
|-----------|--|
| Mug | A container capable of holding hot or cold liquid |
| Umbracity | Umbrella sharing service available on the Vancouver UBC campus |
| Ubysey | The UBC Vancouver Campus newspaper |

LIST OF ABBREVIATIONS

| | |
|-----|--------------------------------|
| UBC | University of British Columbia |
|-----|--------------------------------|

| | |
|------|---------------------------------|
| APSC | Applied Science |
| CO2 | Carbon Dioxide |
| KG | Kilogram (unit of measurement) |
| G | Gram (unit of measurement) |
| IT | Information Technology |
| ID | Identification |
| EIA | Environmental Impact Assessment |

1.0 INTRODUCTION

The University of British Columbia is one of the world's leading universities in campus wide sustainability initiatives. To motivate students to take part in such initiatives, students of the Applied Science 262 class were asked to provide sustainable solutions for the Mugshare program implemented on campus in February of 2016.

The Mugshare program is an initiative in which an interested student can pay a five-dollar deposit to receive a Mugshare card, which will allow access to reusable mugs located at one of Seedlings, Sprouts or Agora Cafe. Students will then return the mug within 3 days to any of the participating cafes, at which they will wash the mug, and prepare it for further use. The overall object of this program is to reduce the amount of waste generated by students' use of disposable cups.

At request of the stakeholder of this program, Allison Fung, our team investigated the viability of the Mugshare program, in the goal of providing recommendations on how to improve the project moving forward. In order to analyse the product and make appropriate recommendations, a triple bottom line assessment is conducted, which includes environmental, social and economical investigation. This report is investigating the application and environmental impact of the Mugshare program.

In analysis of the triple bottom line assessment, multiple factors such as the deposit fee, tracking of the mugs, sustainability of the stainless steel material, and social awareness of the

program are examined. By evaluation of these factors, a conclusion in terms of recommendations is founded; to possibly be implemented by the stakeholder into the Mugshare program.

2.0 ENVIRONMENTAL IMPACT

The Environmental Impact Assessment (EIA) of a proposed project or development evaluates the likely environmental impacts based on beneficial and adverse inter-related socio-economic, cultural and human-health impacts. These assessments are carried out so that both environmental and economic benefits may be attained. One of the main steps of an EIA is assessing and evaluating the impacts and development of alternatives. This section of the report will look into alternative mug materials, as well as sanitization of the mugs.

It is clear that the idea of going green and protecting the environment is very well accepted by consumers, however, having one change their habits proves to be a challenge. Consumers make self-benefiting decisions unless they feel public accountability (Green & Peloza, 2014). For this reason, consumers need to be made aware of and understand the facts associated with the production and use of disposable mugs as well as reusable mugs.

2.1 CUP CHOICE

As illustrated in Figure 1, the preparation of the cup has the most environmental impact for each type of coffee or tea one can purchase at a coffee shop, with the exception of black ground coffee. This indicates how important it is that the mug or cup a consumer is given is environmentally friendly.

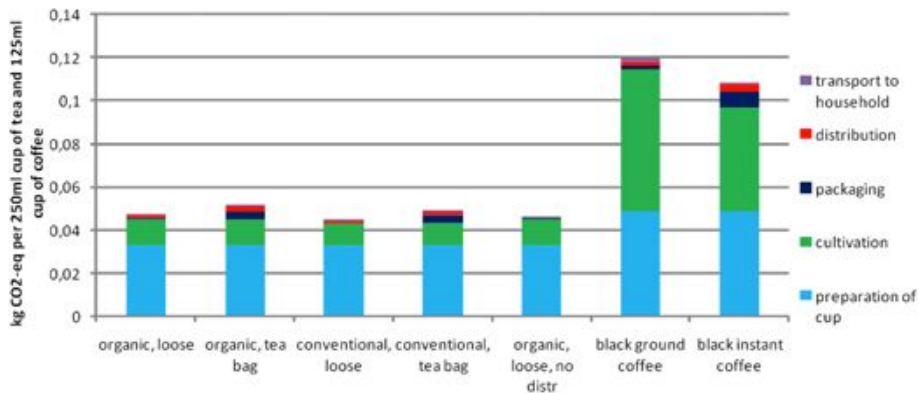


Figure 1: Kilograms of Carbon Dioxide Produced Per Cup of Tea or Coffee

The production of one paper cup requires 4.1g of petroleum, 33g of wood, and 1.8g of chemicals such as chlorine, sodium hydroxide, bleach, sulfuric acid, and sulfur. As well, up to 20kg of waste metal salts are produced per tonne of cups made depending on the type of materials used. After use, these cups cannot be recycled due to the polyethylene coating on the inside of the cups. What's more is that consumers rarely take the time to properly sort their cups, lids, and sleeves with a mere 17% of the 1.5 million disposable cups used on UBC's Vancouver campus each year sorted into the proper waste bins provided (Boyd, 2016).

Along the same lines as paper cups are polystyrene cups. While less petroleum is required to make one cup than a paper cup (3.2g as opposed to 4.1g), the maximum amount of waste metal salts that could be produced from paper cups (20 kg), and more waste gas is produced per tonne.

While it may be argued that ceramics are the best option as they produce significantly less carbon dioxide than stainless steel in production (0.69kg per kg of ceramic as opposed to 6.44kg per kg of stainless steel), the durability and portability of the stainless steel mugs are large factors that influence consumers' decisions. Studies into environmentally conscious behaviour have found that the more reusable and portable a product is, the more likely people are to use it (Son et al., 2014). These findings support the choice of stainless steel, as ceramic mugs are not portable or very durable. The same argument can be made for ceramic thermoses. While ceramic thermos have lids, they are often not a tight seal and spill while sips are being taken. This being said, there are upcoming ceramic mugs with lids that combat this problem.

| Common Material | CF (kgCO2e per kg) |
|-------------------------|--------------------|
| Aggregate, general | 0.01 |
| Aluminium, general | 9.20 |
| Brass, general | 2.61 |
| Bronze, general | 4.41 |
| Ceramics, general | 0.69 |
| Copper, general | 3.22 |
| Glass, general | 0.90 |
| Iron, general | 2.08 |
| Lead, general | 1.41 |
| Chromium | 6.97 |
| Cotton, padding | 1.66 |
| Cotton, fabric | 8.77 |
| Fibreglass (GRP) | 8.87 |
| Precious metal | 6.69 |
| General wool | 0.19 |
| Water | 0.02 |
| Paint, general | 4.13 |
| Paper and card, general | 1.55 |
| Plastics, general | 3.09 |
| Rubber, synthetic | 4.39 |
| Rubber, natural | 1.78 |
| Steel, general | 1.91 |
| Steel, stainless | 6.44 |
| Stone, general | 0.06 |
| Timber, general | 0.47 |
| Tin coated steel | 2.10 |
| Tin, general | 14.52 |
| Zinc, general | 3.56 |
| Food - plant-based | 2.10 |
| Food - animal-based | 3.43 |

Figure 2: Kilograms of CO2 Produced Per Kilogram of Common Material

An example of such a mug would be the Cortiça cork coffee mug. This ceramic mug is insulated with cork to increase durability as well as retain heat. This product is still in early development, but may want to be monitored as the kickstarter was 185% funded, exceeding expectations of the developers. The cork sleeve is easily removable, and both the lid and porcelain are machine washable.

At this moment, stainless steel is the best option for mug material, as Cortiça mugs are \$25.00 each and cannot be directly ordered in bulk. As well, stainless steel mugs are the most insulated and durable, producing significantly less environmental strain than a paper cup after just 24 uses.

2.2 WASHING

The only disadvantage of these mugs is that the stainless steel retains some smell and taste as well as stains if not washed out soon after usage.

This issue can be addressed in the way the mugs are washed. While both the lids and the mugs should be properly sanitized in a high temperature dishwasher, prepping the mugs with a vinegar and baking soda paste before placing into the washing machine will eliminate any residual smell or taste retained by the steel. This would also ensure that not all cafe workers need to be certified in food safety protocols, as a proper dishwasher will be used.

3.0 SOCIAL IMPACT

One of the aspects that needs to be highly considered is the social impact of the Mugshare program on the students of UBC. The introduction and acceptance of this program relies a great deal on the reaction from the students at UBC and their willingness to adopt the initiative.

The Mugshare program was started by the Common Energy campaign team in response to a waste audit that was carried out on the old student union building. This campaign team is student lead and, as such, is able to have insight into the wants and needs of the student body as a whole.

The program aims to change the negative results from the audit, which showed 1.5 million disposable cups being used each year on campus, with only 17% correctly sorted into the proper waste bins (Boyd, 2016). It is clear from these results that a social change is needed and the Mugshare program is a good starting point. The base purpose of this project is to promote the use of a reusable stainless steel mug instead of using disposable, one-time use cups from cafes on campus. This will, in turn, reduce the amount of waste that is produced from the cups, lids, and sleeves.

Students are able to sign out a reusable stainless steel mug when buying a drink from participating cafes. The student uses this mug and then returns it within a given timeframe for it to be washed, and reused.

3.1 PARTICIPATION

After a year of brainstorming, the initiative was officially opened last month in three participating cafes; Seedlings, Sprouts and Agora. One of the questions asked on a survey to participants carried out by our group was: “What motivated you to join the Mugshare?”. The

results show that the majority of students, with 83.3% of answers, joined to reduce disposable cup waste (see figure below).

1) What motivated you to join Mugshare? (Select all that apply) (12 responses)

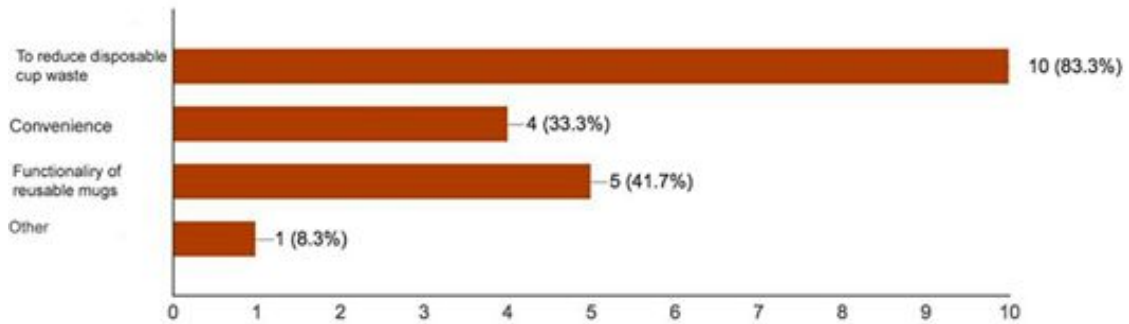


Figure 3: Survey Question #1

This suggests that the target audience for the program is people who are environmentally conscious, with a much smaller percent of the audience joining for convenience and functionality (33.3% and 41.7% respectively). This group of people is quite small and, as seen in Figure 4, already use a reusable mug.

4) Did you bring a reusable mug to school before joining Mugshare?

(13 responses)

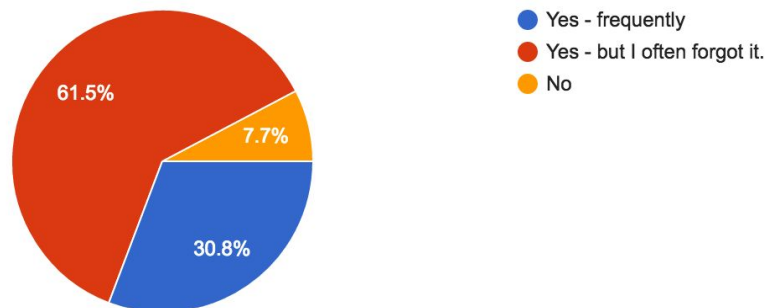


Figure 4: Survey Question #4

From these results and the fact that, as of now, there are only 34 participating members, it is clear that the Mugshare program has a serious lack of student participation. For the Mugshare program to have a serious impact on the sustainability of UBC's campus, the program needs to be brought to the attention of many more students. There are two major ways in which this could be accomplished: advertisements and incentives. We believe that constant and positive reinforcement of the program will increase awareness of the project and encourage more students to join.

The first way, as mentioned above, is advertising; a method that has been very successful for other campus initiatives. We believe that one of the main reasons for lack of participation is the lack of awareness around campus and this could be fixed by posters and articles. An article was already published in the Ubyyssey, however there is a lot of untapped potential in the form of other news sites and websites around campus. One such website that can be utilised is the facebook groups for each respective graduating year. These groups each contain upwards of 20,000 members, making a single advertising post viewable to an extremely large audience.

A vital part of this method of advertising is appealing to the new round of first year students arriving in September of 2016. As seen in Figure 5, it was indicated that almost $\frac{1}{4}$ of the current participants are leaving UBC this year and will therefore not continue with the program. As such, we believe that appealing to the first year students will bring a lot of new participants and improvements to the program. An easy way to accomplish this is to put posters around the first year dormitories during move-in and the first few weeks of school. This will increase brand awareness and make a name for the program with students.

8) Would you participate again next year? (13 responses)

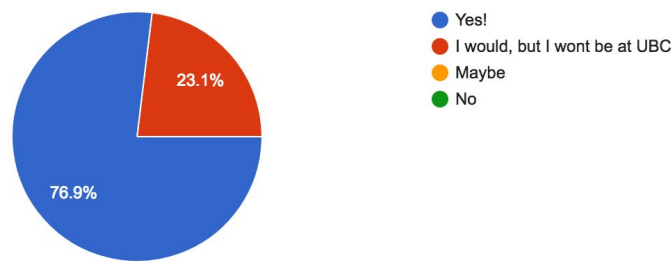


Figure 5: Survey Question #8

The second method of increasing participation is positive reinforcement through incentives. Incentives could be provided to students once they sign up for the program as well as through the course of the semester. Such incentives could include an entrance into a raffle to win items such as a Starbucks gift card. We believe a raffle is a good idea as it appeals to the masses with only a small payout, and is therefore a very appealing and cost effective method. The appeal of a prize for signing up for the program could increase participation amongst students.

To ensure that the program is fully utilised and students do not just sign up and forget about it, we also believe that incentives should be offered throughout their membership. Such examples could include an award for the person with the most returns over a certain time period and, if possible, discounts at certain participating cafes for using the mug. This discount is already available in certain cafes on campus including 'The Loop Cafe' and is therefore plausible for the program.

3.2 EXPANSION

Regardless of the amount of advertising that is carried out, we believe that it is essential for the Mugshare program to expand into many more cafes for it to be successful. As mentioned above, the program is currently only available in 3 participating cafes: Seedlings, Sprouts and Agora. These cafes are very small in terms of sales per day in comparison with other cafes and vendors around

campus. Survey results illustrated in Figure 6 show that the main areas that students want the Mugshare program to expand into the most are: The Nest, Tim Hortons and Starbucks. The answers to this question were as expected as these locations see the most foot traffic and coffee sales.

6) What other locations would you like Mugshare to be expanded too?
(13 responses)

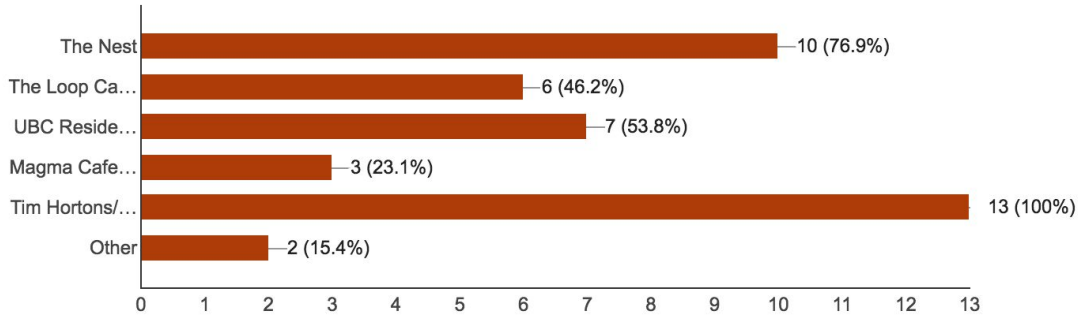


Figure 6: Survey Question #6

Inability to expand into these locations is an issue that will hopefully be resolved with time, as UBC Food Services will need to see evidence of a successful, running program. With growth and improvement of the program, we recommend looking into further expanding the program. If the program is accepted into the major coffee suppliers on campus, we believe that this would enormously increase participation and effectiveness of the program as a whole.

4.0 ECONOMICAL IMPACT

The analysis of the economical impacts of this program is vital as these factors determine whether or not the program will grow and be able to provide the benefits listed in the social and environmental impact sections. The analysis was carried out primarily with the Mugshare program's longevity in mind, thus analyzed the benefits/deficits of the program's current economical model and practices.

4.1 PROGRAM ECONOMICS

The current economic model in place for the program is based around a \$5 membership fee. This deposit grants the customer a membership card, which must be turned in to receive a mug with one's beverage, and is given back upon returning one's mug to one of the participating cafes. At the end of a student's academic term, they may turn in their card to recover their initial membership fee. Currently, the program utilizes only stainless steel travel mugs and can support up to 60 members.

4.2 CURRENT ECONOMIC SITUATION

The program started relatively recently (February of 2016), thus is still relatively small in size and awareness, with 34 current members. At this scale, the program cannot be considered stable or well established, as to be expected in its early stages.

The program is only offered at a select few small student run cafes on campus which are not very well known to the student body. Students have expressed that they would like for the program to expand to the popular chains on campus.

The mugs currently in use are a stainless steel variety, costing \$14 per mug. Researching alternative suppliers is deemed necessary as this cost is quite high for the program to be successful.

The current system for checking in and out mugs is very low-tech and it is difficult to track an individual mug once checked out. The possibility of theft is especially a concern due to the mugs

costing \$9 more than the membership fee. This means that every cup stolen or lost is a \$9 deficit for the Mugshare program, or a potential \$9 profit for a malicious customer. This issue is seen as relatively high priority.



Figure 7: Illustrative Representation of Malicious Thief

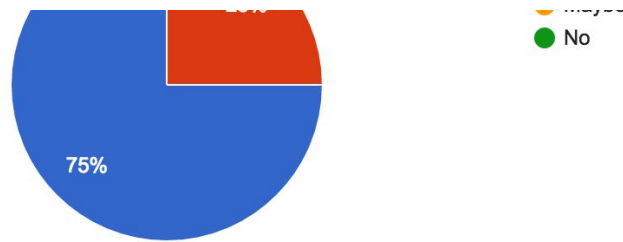
5.0 RECOMMENDATIONS

To combat the issue of the limited awareness, more aggressive advertising is needed. There are many ways this could be carried out, including:

- Posters placed in public areas with high traffic
- Events displayed prominently on campus, actively engaging and encouraging students to join the program
- Cashiers actively suggesting that people join the program in the early stages
- Advertising logos on checked out cups

To address the issue of limited program adoption on campus, direct communication and collaboration with UBC Food Services will be necessary. This will allow for the program to operate at the more popular places on campus, making the program more accessible to students and therefore encouraging more people to join out of convenience. At this time, pushing for the expansion into UBC Food Services is likely to be unfruitful as it may create complications regarding cup distribution as well as require updating employees on their new responsibilities. For this reason, the program should be established and somewhat expanded first before approaching UBC Food Services so as to have more of a case for the benefits of adoption of the program. Additionally, UBC Food Services is more likely to accept a program if it attracts significant amounts of positive attention, which will come with growth of the program.

To address the issue of mug expense, we have addressed two potential strategies. One would be to increase the initial deposit fee, so as to cover the cost of the mug. As seen in Figure 8, the survey conducted indicated that the majority of students would be willing to pay up to \$10, twice the current amount, for the deposit.



9) What would be the maximum deposit you would be willing to make in order to participate? (You get this back at the end of the term)

(12 responses)



Figure 8: Survey Question #9

Although this would mitigate losses, lost mugs would still be a loss for the program and would not fix the problem in its entirety. A larger deposit to cover all potential losses to the program might turn away possible participants, therefore, we deem it essential to seek cheaper mugs in the future. Table 1 includes a variety of potential options and their prices.

| Name | Price per unit (Bulk Quantity Required) | Source |
|---|---|---|
| Oggi 5068.3 Lustre Stainless Steel Travel Mug, 14-Ounce, Black | 7.99 (1) | https://www.amazon.ca/Oggi-5068-3-Lustre-Stainless-14-Ounce/dp/B000LWC3NO/ref=sr_1_8?ie=UTF8&qid=1459901183&sr=8-8&keywords=stainless+steel+travel+mug |
| 14oz Travel Mug Stainless Steel Thermal Hot & Cold Travel Drinks Cup Mug Thermos | 8.52 (1) | https://www.amazon.ca/Travel-Stainless-Thermal-Drinks-Thermos/dp/B00IYJAR9S/ref=sr_1_12?ie=UTF8&qid=1459901364&sr=8-12&keywords=stainless+steel+travel+mug |
| 16 oz. Budget Stainless Steel Insulated Travel Mug | 9.84 (12) 4.56 (50) 3.74 (100) | https://www.discountmugs.com/NEWproduct/st65-16-oz.-stainless-steel-insulated-travel-mugs/ |
| Promotional 450ML cheap buy bulk travel mugs, brushed finished stainless steel coffee mug | 5.26 (100) | http://www.alibaba.com/product-detail/Promotional-450ML-cheap-buy-bulk-travel_60217752957.html?spm=a2700.7724857.29.3.uCFB0L&s=p |
| Hot Selling custom cheap stainless steel bulk coffee travel mugs | 0.92-2.23 (500) | http://www.alibaba.com/product-detail/Hot-Selling-custom-cheap-stainless-steel_60045488585.html?spm=a2700.7724857.29.178.uCFB0L |

Table 1: Prices of Mugs

In response to the current issue with tracking mugs and their members, we suggest using a software-based system connected to students' and staffs' UBC Campus-Wide-Login accounts. In our proposed system, mugs will all be given a unique barcode which will be scanned upon check out or return. The data will then be stored and tracked using a simple database. This implementation would be very similar to the UmbraCity model in which students take out an umbrella and are expected to return it within several days. If one fails to return the umbrella on time, a late fee is charged to their account. This fee increases for every consecutive day an umbrella is late until the cost of the umbrella is covered. This will require little effort on the cafe's side, as baristas will simply have to run a barcode scanner over a mug before sending it off with a student. The challenge then becomes obtaining the software and utilizing it effectively so as to keep students liable for their mug usage.

Our recommended method of solving these issues comes in the form of one single solution: hand the implementation off to an engineering Capstone project team to develop the hardware/software combination. This would keep the work on campus to maintain a sense of community in the program, as well as keep costs low as professional software development can be costly. Integration into the already existing UBC Campus-Wide-Login system would be optimal in ensuring any accrued fees will be paid along with one's student fees. Additionally, providing one's student ID to check out a mug could prove to be the most efficient. Extensive collaboration is required between the program's software team and the UBC IT department to allow for the software to have access to student accounts.

6.0 CONCLUSIONS

The Mugshare program's implementation of reusable cups has the capabilities to reduce both energy emissions and the amount of waste generated by students on campus. The program has the potential to be successful in both its popularity, and its impact on the reduction of waste, however it faces several challenges that need to be addressed to ensure the future success of the program. The concerns currently facing the program include: lack of awareness for the program, inefficient tracking of the mugs, the deterioration of the mug coating, and the current price of the initial deposit.

To fully maximize the impact of the Mugshare program, expansion into UBC Food Services is necessary. The survey conducted demonstrates that participants in the program would like Tim Hortons, Starbucks and The Nest to be among participating venues. An expansion to such venues would vastly increase public awareness of the project, as the current participating cafes are, for the most part, unknown to a large portion of the student community. Additionally, public awareness campaigns and ads should be launched in popular public areas, such as the Nest, to increase participation in the program. Incentive rewards should be put in place to motivate students to join, including entry into a raffle upon signing up.

Under evaluation of similar campus wide programs such as the UmbraCity model, and the Dalhousie University Mugshare, the program should look to implement barcodes on each of their mugs in order to efficiently track mugs once they have been signed out by a member of the program. Such barcodes should be printed or etched onto the mugs to ensure durability, and should be linked to students UBC Campus-Wide-Login accounts to improve accessibility and ease of use of the program.

As aesthetics are not of serious concern, as founded by our survey, the mug should have no coating as to reduce residual build-up in the dishwashers, and to reduce the deterioration of the cup's

rubber bottom. While stainless steel is currently the best option, further effort may want to be put into monitoring the development of Cortiça ceramic and cork mugs.

As shown by Figure 7, participants in the program suggest that the deposit be increased to \$10. This would reduce loss of mugs due to theft, and would allow the program a larger budget for purchase of more mugs and widespread advertising.

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