An Investigation into Campus Accessibility

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ABSTRACT

In order to meet the mobility needs of disabled students at the University of British Columbia, a campus accessibility map needs to be implemented to provide quick access to information regarding accessible routes. Secondary sources were consulted to gather information on existing services and projects that have been successful. These sources include news articles from university publications in North America, as well as peer-reviewed articles on the challenges that need to be met regarding campus accessibility. Furthermore, a survey has was conducted on a group of 24 UBC students asking them to identify inaccessibility hotspots on campus, or areas that may be challenging for disabled students to travel through. Additionally, the group was asked to indicate factors that will help increase community involvement.

The group of students identified the intersection of Main Mall and University Boulevard, or the Martha Piper Plaza, as the biggest hotspot for inaccessibility. This may be due to the volume of traffic that constantly experienced in the area. The group also identifies interactivity and simplicity as the features desired in an accessibility map. This may allow them to gather personalized information on routes to take. Finally, the group identifies a point-system or monetary incentives as factors that motivate them to increase involvement in such a project.

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GLOSSARY

Application Programming Interface	A set of tools, routines and protocols created to help build software programs
Campus Accessibility Map	Campus-specific map that identifies access-friendly routes for disabled members of the campus community
Geo-crowdsourcing	Feature that allows users to update the application database in real-time on certain changes on campus routes, as well as other relevant information
Mobile application	A program or interface that is designed specifically for a mobile phone or tablet such as the iPhone, iPad, or an Android device
Web application	A website that allows user interaction. Users can provide input, modify data from the database, or modify certain elements of the page

1.0 INTRODUCTION

This report investigates the key accessibility issues faced by users of the University of British Columbia (UBC) campus. The information presented in this report was obtained from online sources and articles, as well as from a survey conducted by our project team. The goal of our research was to discover new ways of improving accessibility that are most appropriate for the UBC campus.

When designing new features for a university campus, it is important to consider its physical characteristics and community demographic. The layout of the UBC campus is unique due to its massive size and the open space design between buildings. In addition, the heart of the campus is mainly pedestrian based and has few major roads for vehicles. Although these design choices can be visually appealing and refreshing compared to other campuses, they also introduce accessibility concerns such as increased travel times and a lack of vehicular access to inner areas. These issues are amplified by frequent building construction that restricts many navigation routes for long periods of time. The key location of UBC and its surrounding attractions also draws in many outside visitors. Thus, any ideas for accessibility features must be easy-to-use not only the student and staff population, but also for the general public.

The report begins with an investigation into a description of campus accessibility and the approaches of other universities used to deal with inaccessibility. This is followed by a description and analysis of survey data collected from UBC students. Lastly, the report will conclude with ideas and recommendations for improving campus accessibility.

2.0 APPROACHES TO CAMPUS ACCESSIBILITY

Although the types of accessibility issues vary between campuses, they have comparable effects on student well-being and can be dealt with in similar ways. Observing the examples of other institutions provides useful insight as to what accessibility features have been successful, and how they can be implemented by UBC. This section will explain general requirements for accessibility features, describe some common features of campus accessibility maps, and provide an example of a successful implementation of an accessibility feature.

2.1 GENERAL REQUIREMENTS FOR ACCESSIBILITY FEATURES

For an accessibility feature to be effective, it must take into account the needs of the user population itself. A study by Simonson, Glick, & Nobe (2013) found that the features of recently-built structures often focus on mobility disabilities such as wheelchair users, rather than other prominent visual, auditory, medical, and cognitive impairments. Students with auditory and cognitive impairments had a lower perception of the quality of education they were receiving compared to other disabilities. In general, disabilities that do not have immediately visible traits are often underrepresented (Davis, N. A, 2005). A generic solution to this is to focus on features that are applicable to the needs of all students, such as better and more prominent signage. An even more effective solution would be to analyze the user demographic to ensure that each disability is accounted for accordingly.

A paper by Karimi, Zhang & Benner (2014) highlighted three general requirements for accessibility features. The first requirement is that accessibility information must be constantly updated in order to be relevant to the current situation. This is especially important in the context of UBC due to the issue of constant building construction. Secondly, accessibility information must be utilized in meaningful ways such as real-time navigation or route planning. A sign that provides specific routes to a location is much more useful than only a map alone. Lastly, the presentation of accessibility information must be easy-to-access and easy-to-use for the general public.

2.2 COMMON FEATURES OF CAMPUS ACCESSIBILITY MAPS

A well-designed campus accessibility map is a highly important tool to promote accessibility in terms of navigation routes, accessible entry points, and facilities such as elevators and washrooms. Maps are frequently used by those who are new to the campus, and they can be

placed on a variety of signage or print in addition to being available online. For this section, we will use the campus accessibility maps of McGill University and the University of Western Ontario as primary examples. A picture of the McGill University map is shown in Figure 1 below.

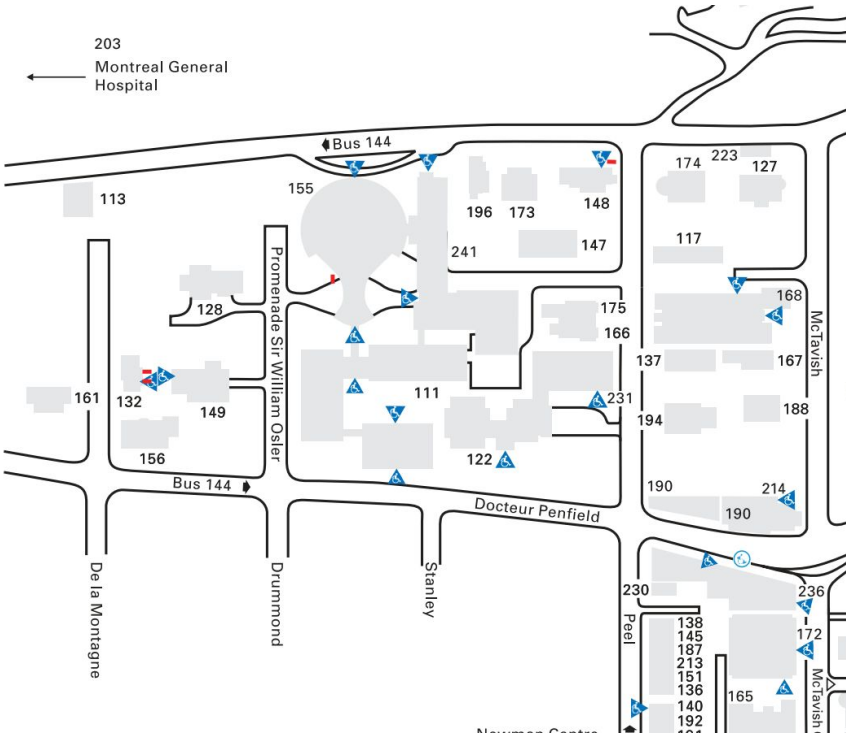

Figure 1. A section of the McGill University campus accessibility map

As part of their Campus Access Guide, McGill University provides a simple yet informative campus map which clearly shows major roads and buildings, as well as accessible entry points and parking. In addition, there are fully detailed floor plans for all of the main buildings which show doorway, elevator, and washroom locations. These floor plans can be easily found on the webpage through a list of building names. The maps are also simple enough that they can printed out and still be readable, making it convenient for those without Internet access. Although the map is not very interactive, and does not provide direct route information, it is still very informative and easy-to-use.

Similarly, the University of Western Ontario provides floor plans for every building and floor. An excerpt from a building floor plan is shown in Figure 2 on the next page. The room numbers and building names are shown directly on the map as well, making it slightly more detailed and informative. Notices of detours and building construction are also viewable as a map on the same page.

Figure 2. Building floor plan from the University of Western Ontario

Our team found that the accessibility maps from UBC lacked many features when compared to these universities. Footprint maps for each building are difficult to find and requires the user to navigate through many webpages just for one building map. The maps are also not as detailed or readable, do not have building floor plans, and there is no accessibility map for the overall campus. While there is a map of ongoing construction, it is not featured on the same page; ideally, the user should be able to find such information without having to view a different map. However, the UBC maps do have a useful feature that displays short routes from nearby locations, making it easier to locate a building.

Another consideration for a campus accessibility map is the platform from which the map will be used. A current trend in mobility technology is the use of online services for maps and navigation. Such services are often offered in the form of an application on the Web, or as a standalone application installed to a mobile device. When comparing the two, a web application can be used by a wide range of devices and is generally easier to find online, especially for those who are not so familiar with mobile devices. Outside visitors to a university campus are also

more likely to search for a map on the Web first before looking for a mobile app. However, once installed, the standalone app can offer more features, a more direct approach to the service, and offline usage. Because the scope of a university's user base is not very large, and maps do not need to be repeatedly used by frequent visitors, a web application is often better suited for a university campus map.

One useful and innovative feature that our group has discovered is the use of crowdsourcing. Crowdsourcing allows the users to provide their own map and route information, which will be shared with others immediately. This allows community involvement, where individuals can provide info on road obstructions and wheelchair accessibility with the click of a button. Such a feature provides large amounts of data that is cheap and easy to obtain. Moreover, the services mentioned can come with Application-programming interfaces, or APIs, which are tools that allow software developers to easily implement the service. One major concern is creating incentive for users to participate, but with a balance of user input and a dedicated team to provide map information, it can still be more informative and up-to-date than a traditional map.

2.3 PERSONALIZED ACCESSIBILITY MAP USING GEO-CROWDSOURCING

In the effort to meet the mobility needs of disabled students, multiple services have been established in the United States in order to provide adequate information on accessible routes. Such services include Access Together, AXS Map, or Wheelmap. Additionally, Karimi, Zhang, and Benner (2014) have compiled a diverse list of both city-wide and campus-based accessibility services ranging from web apps that provide detailed descriptions and images of accessible areas, to multiple campus apps across the States. However, Karimi et al. have found the need to implement geo-crowdsourcing in their own app, a feature that has not yet been implemented on any of the campus-specific services they have encountered (Karimi et al. 2014). Such a feature would allow for a dynamic source of relevant routing information that can accommodate input from almost any user.

By identifying the specific needs and concerns of disabled individuals, along with data obtained from the services they have gathered, Karimi et al. have implemented a prototype web application for the University of Pittsburgh community. The web application uses Google Maps' Application Programming Interface in order to provide basic mapping functions, as well as the university's own servers in order to identify the pedestrian networks on campus. The university's pedestrian network also identifies relevant points of information, which include tunnels and campus crosswalks. The map can compute navigation routes between buildings, as well as display shuttle routes, accessible entrances, and the location of sidewalks (Karimi et al. 2014). An overview of the map interface is shown in Figure 3 on the next page.

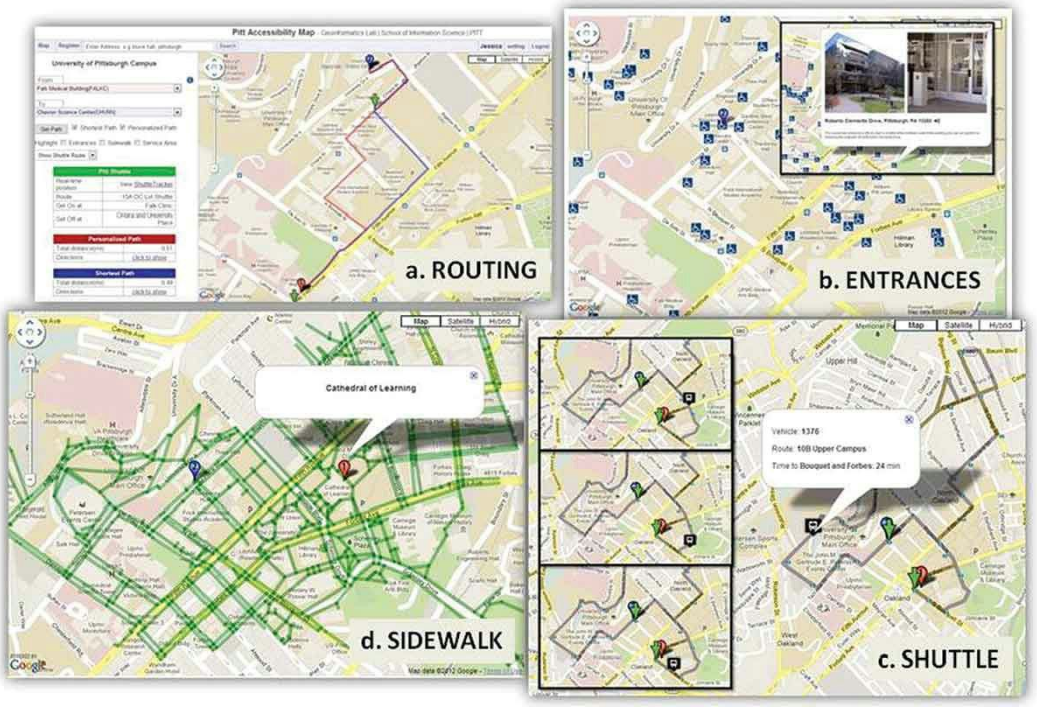

Figure 3. Personalized accessibility map from the University of Pittsburgh

There is room for improvement on the described prototype for the University of Pittsburgh's personalized accessibility map. The application is lacking in service for visually impaired members of the community. Future development will attempt to implement real-time auditory guidance. Likewise, it runs the risk of having outdated data in its servers if the crowdsourced information is not routinely updated and verified, which is a risk for any existing geo-crowdsourced mapping service (Karimi et al. 2014).

2.4 IMPACTS AND INDICATORS

This section briefly discusses the impacts and indicators in a social and economical context when introducing a new accessibility feature.

I. Social

Projects that increase accessibility are met positively by the student population. This allows students to take part in improving campus life for their peers. This is an important goal to achieve for a university such as UBC, which prides itself on being accessible and welcoming to students of all backgrounds.

Student involvement is an important aspect in any project that aims to improve campus accessibility. This is especially true for a software application that relies on crowdsourcing to continually update its information. The quality and quantity of involvement depends on factors such as advertising and public service announcements to increase awareness. It may also depend on incentives provided for students should they participate and actively contribute to crowdsourcing efforts.

II. Economical

The price for developing web and/or mobile applications depends on the complexity of the software. Factors that contribute to complexity include, but are not limited to, features to be implemented and the number of active users. An estimated cost for a university-based map application that can provide real-time information may range anywhere from 40,000USD to 50,000USD. Development time may take up to 18 weeks (Mehra, 2015).

3.0 SURVEY ANALYSIS

This topic is relatively new at the University of British Columbia, so it was evident that primary source investigation would be critical to finding a solution. The following section discusses the questions that our group looked to answer, the survey that was conducted, and the results that were determined.

3.1 BACKGROUND AND STUDY DESCRIPTION

The campus accessibility project is unique because it is a project that is very campus-dependent. The material presented, and the information that we seek to find, is specific to the University of British Columbia. As such, secondary source investigation is relevant, but it alone does not provide a final conclusion.

The primary investigation that we conducted consisted of interviewing our project clients and those that were interested in the topic. Furthermore, on-site research, as well as a survey through Google Forms were conducted. Our clients consisted of Janet Mee, Director of UBC Access & Diversity, as well as Rachael Sullivan, the Equity and Inclusion Educator at UBC Vancouver. Through the workshop conducted in class, our clients made it aware that they were keen to hear about what the students of UBC were looking for. The main questions that they presented were:

1. What would motivate UBC students to contribute to this project?
2. Where on the UBC campus do students identify as inaccessibility hotspots?
3. What challenges regarding accessibility are identified the most by students?
4. What would UBC students like to see in a campus accessibility map?

We sought to answer these key questions through our survey. The survey generated 24 responses, mainly from UBC Engineering students. The results would be more accurate if more students were surveyed, and if the pool of students was well spread throughout various faculties to generate a better variety of opinions.

3.1.1 Desired map types

After conversing with classmates regarding this topic, it was determined that the most prominent challenge regarding accessibility was a lack of easy-to-use maps that students would find

engaging and motivating to use. With this in mind, the first question asked in the survey is shown in Figure 4.

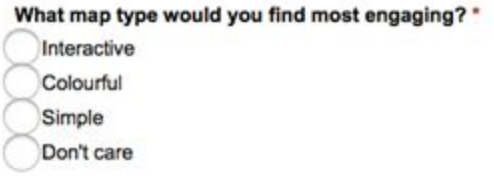

Figure 4. Question 1 of the survey

This question was asked to determine what the potential app should focus on in terms of creativity, and the aesthetic associated with it. This question generated mixed results, as illustrated in Figure 5 below.

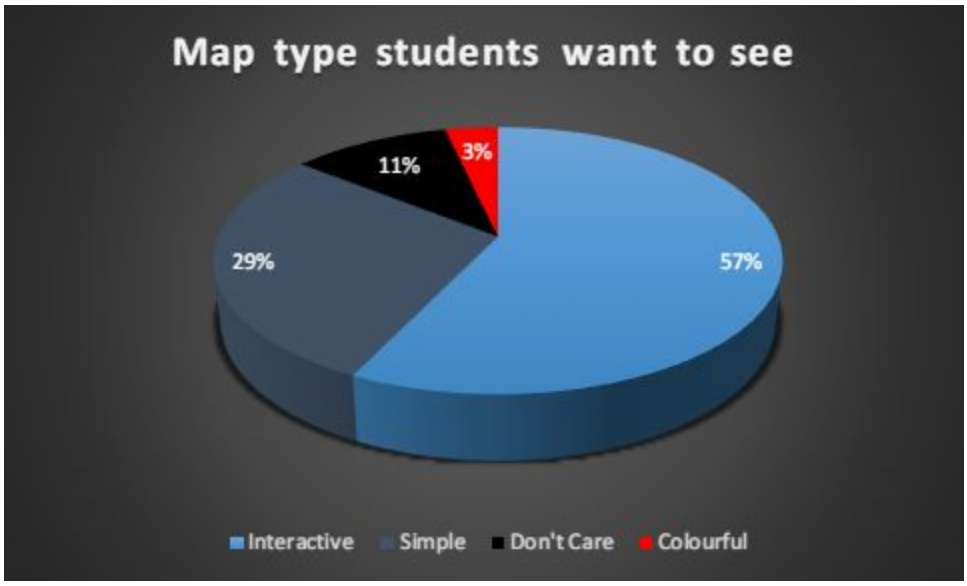

Figure 5. Results from question 1 of survey

The distribution is clearly illustrated the chart above, indicating that 57% of students surveyed believed that an interactive map type would be most engaging. 29% believed simplicity was essential, while 11% were apathetic and did not care and 3% believed a colourful map would be ideal. This information presents positive results, because an interactive map will be easy to present in an electronic application that Access & Diversity is currently working on. The first question in the survey answers the one of the main questions that were sought to be answered (Question 4), and also begins to answer another one (Question 3).

3.1.2 Inaccessibility hotspots on campus

To formulate the next question in the survey, the team had to conduct on-site research. The team was looking to find campus inaccessibility hotspots at UBC, in order to choose four main areas that consistently were either under construction, on an incline, or generally difficult to access. The following areas were identified and illustrated in Figure 3: Martha Piper Plaza, University Boulevard & Wesbrook Mall intersection, Agronomy Road & Main Mall intersection, and West Mall & University Boulevard intersection.

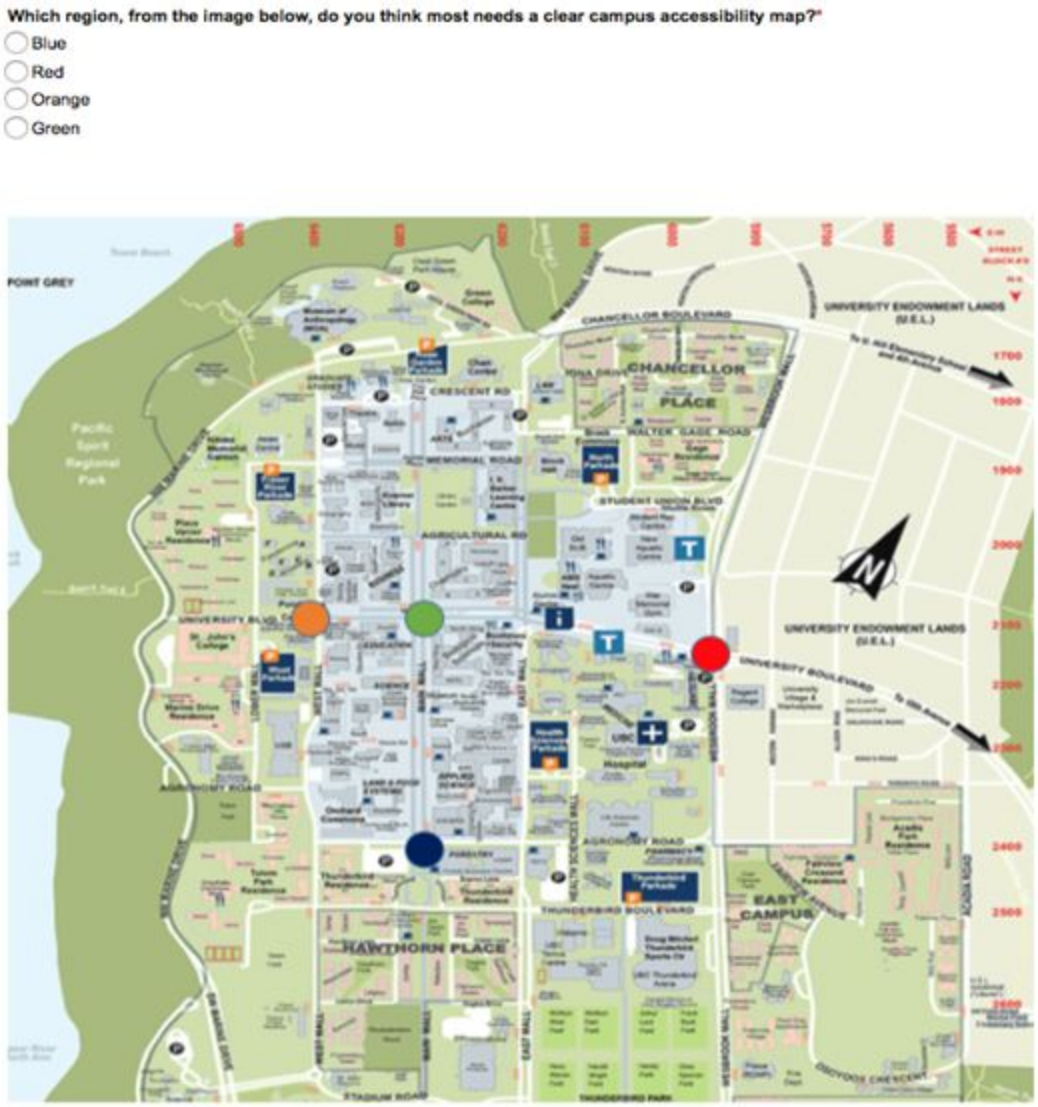

Figure 6. Question 2 of the survey

Students were asked to identify which of the 4 spots they identified as accessibility hotspots. The observations were compiled into a chart illustrated in Figure 7 below, yielding interesting results.

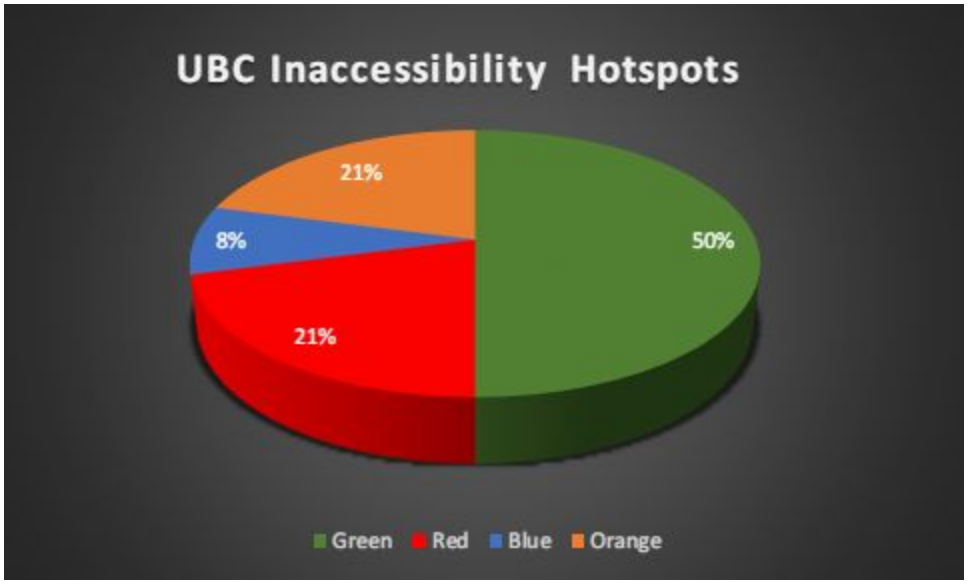

Figure 7. Results from question 2 of survey

The results correlated with our predictions and made it quite clear as to where these hotspots on campus are. Martha Piper Plaza was identified as the most in need of accessibility resolutions. In summary, 50% of students identify Martha Piper plaza as the most problematic hotspot, while 21% of students chose University Boulevard & Wesbrook Mall, 21% of students chose East Mall & University Boulevard, and 8% chose Agronomy Road & Main Mall intersection. The group predicts that this is because the majority of students, regardless of faculty, cross Martha Piper Plaza most frequently between classes and during breaks. This question clearly answers the question presented by Janet Mee and Rachael Sullivan regarding locations students consider inaccessibility hotspots. With these results, it is clear that Access & Diversity should focus its primary attention on Martha Piper plaza, yet still putting emphasis on the other hotspots in the study, as well as the rest of campus.

3.1.3 Incentives to participate

The final question that was asked in the survey was formulated to answer the first main issue our group sought to answer. This question involves answering how the students can be motivated to care about accessibility, and how to engage them in contributing to the project or the app that is being developed. The question posed in the survey can be seen in Figure 8 on the next page.

What would motivate you to contribute to the Campus Accessibility app that is being developed?*

- ◯ Monetary incentive
- ◯ Point system whereby you attain points to stores that can be redeemed on campus.
- ◯ Don't Care

Figure 8. Question 3 of the survey

For this question, we gave the option of either a monetary incentive or a point-based reward system. In addition, we left a 'don't care' option for those who felt indifferent about having a specific incentive. The results to this question can be seen in Figure 9 below.

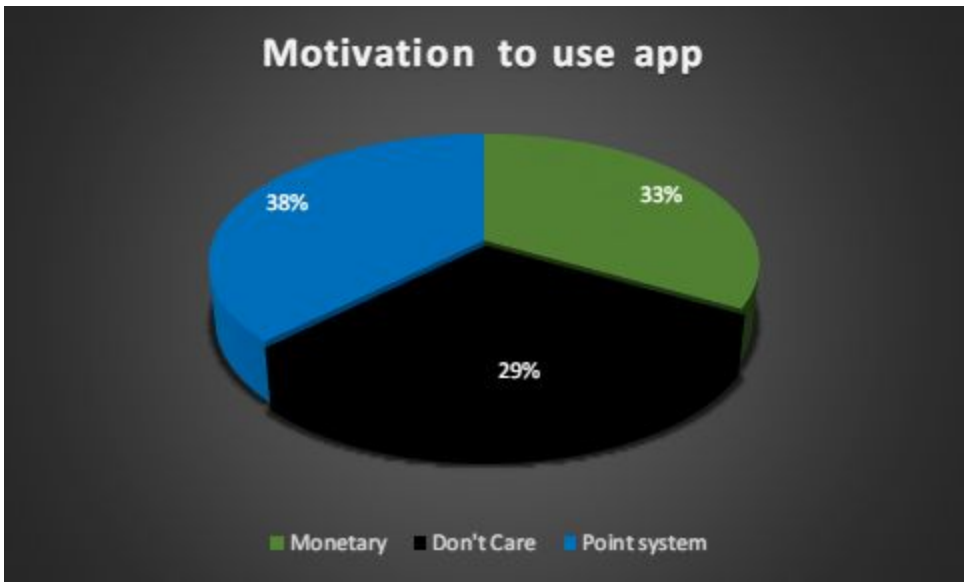

Figure 9. Results from question 3 of the survey

Janet Mee emphasized the importance of answering this question. If students are not motivated to use an app, then it will ultimately not be useful and engaging for the community. Given that the current map interface for UBC is very outdated, there is a huge potential for this app if students buy into the concept. The monetary incentive and indifferent responses are straightforward; however, the point system is slightly more complicated. Using this information, our group proposed an idea that follows a concept used by an app called Pocket Points Inc., which is available in Apple's app store. The app follows a simple concept, where students can earn points for not using their phone in class, as seen in Figure 10.

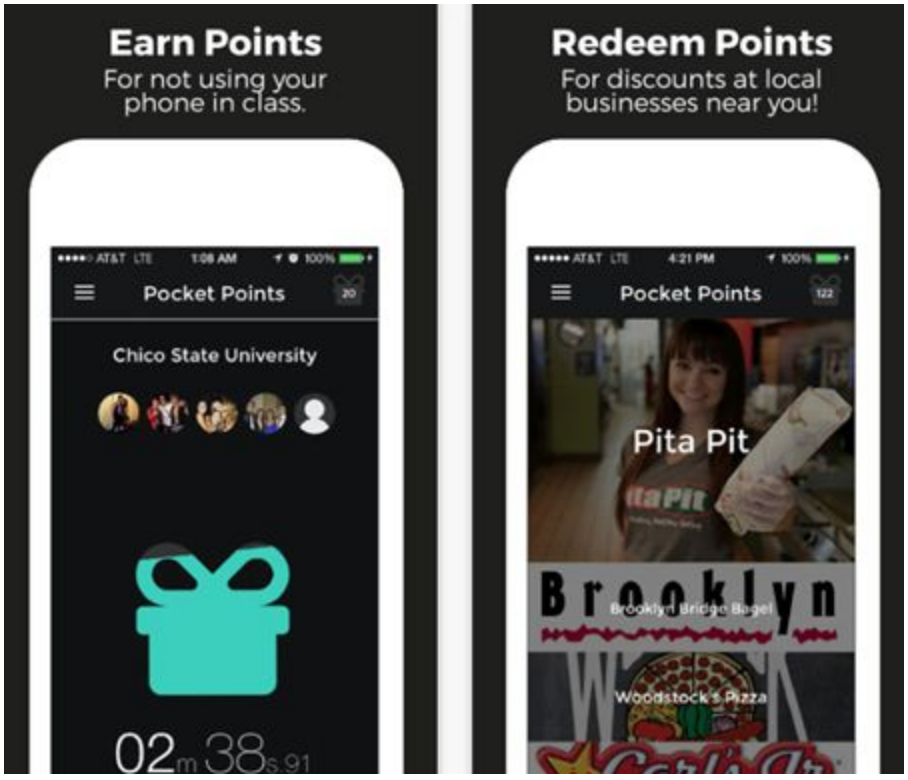

Figure 10. Image of Pocket Points Inc. app
Retrieved from: https://itunes.apple.com/ca/app/pocket-points/id908136685?mt=8

This point system works in collaboration with various on campus establishments such as restaurants and bookstores, where students collect points for not using their phone in class that they can later redeem for rewards. This question found that 38% of students would be interested in using such a point system based app, while 33% of students want a monetary incentive and 29% were indifferent. Although only 38% of students chose a point system, the use of a system similar to Pocket Points Inc. would also likely provide a monetary incentive that appeals to the next largest group. With this in mind, 71% of students would potentially be in favour of using such an app.

3.2 SURVEY CONCLUSIONS

This survey was very informative and provided insight to the issues laid out in section 3.1. In summary, 57% of students want to see an interactive map in this app, 50% of students believe that Martha Piper Plaza is an inaccessibility hotspot, and 71% of students would be motivated to use an app with a similar concept to Pocket Points Inc. With the results in mind, this group recommends the implementation of an app that follows a similar system to Pocket Points Inc.

4.0 CONCLUSION AND RECOMMENDATIONS

Through the research and study conducted, it can be concluded that campus accessibility maps are unique projects that are specific to their relative locations. The University of British Columbia is a vast campus, and thus creating a campus accessibility map is a tremendous challenge. There will always be obstacles that obstruct with the most efficient use of the accessibility map. In the case of UBC's campus, it is the constant development and the never-ending construction that interferes with accessibility around the campus.

However, there are various ways around this hinderance that involve making the campus accessibility map easy-to-use and efficient. Two key factors play a crucial role in making the accessibility map a success: technology and community. The map should be user-friendly (through an interface) and easy-to-access. Furthermore, everyone in the area should be able to contribute and update the map as frequently as possible, which provides useful information while strengthening the sense of community on campus. One way to get more people involved, as mentioned in section 3.2, is to give the community an incentive. In this case, either a monetary incentive or a point incentive can be incorporated. The results from our survey showed that majority of the people prefered either a monetary or a point-based reward incentive. Due to the campus being vast, by having the community play a part in sending updates for the map whenever necessary, the map becomes more efficient and accessible for everyone.

To incorporate both the technological and community factors in the development of the campus accessibility map, the most dynamic route to take would be to comprise a system of crowdsourcing. Crowdsourcing is not only a technological advancement when it comes to campus accessibility, but it also includes the community that increases the coherence of the map as a whole. For a university-based map, a web-based application is ideal and can be adapted to mobile applications if necessary. The map must also incorporate other ease-of-use characteristics such as readability, route navigation, and being informative of accessible facilities.

The most important element of this campus accessibility map is community. A larger, campus-wide survey (student body and faculty included) should be conducted to know more about the demographics on campus. All disabilities should be represented in this larger study, for the accessibility map to be completely successful. Essentially this map is to improve mobility and life around the campus and the community. This is a great initiative taken by the community to make the campus more effective and efficient, for the rest of the community.

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