MacChangers 2019/2020 Report

Compilation of MacChangers Student Project Briefs

MAC CHANGERS

PAUL R. MACPHERSON INSTITUTE FOR LEADERSHIP, INNOVATION AND EXCELLENCE IN TEACHING

McMaster University

BRIGHTER WORLD

Letter from the Director

For our team, the past year was an exciting one in which we expanded our vision, deepened our partnerships, and engaged in work that produced exciting results. For readers learning about our program for the first time, MacChangers is a co-curricular program that pairs multidisciplinary teams of students with community partners in order to propose innovative solutions to some of the local challenges facing the Hamilton community.

This year marked the fifth iteration of the program, as well as the largest and most diverse group of student participants to have ever completed the program. With 81 students and representation across all faculties, students worked to solve problems in the areas of pedestrian safety, the opioid crisis, resilient infrastructure, social sustainability, and more. This report details each of the MacChangers Projects completed in the 2019-2020 year as well as the students who participated in each of these projects.

There are a lot of individuals without whom this year would not have been possible. I would like to extend my deepest gratitude to our community partners that volunteered their time to join us on campus and support our students' learning journeys. After reading this report, I am certain you will see the extent of learning obtained through their guidance and mentorship.

I would like to thank the Faculty of Engineering, specifically Dean Ishwar Puri and Arlene Dosen, as well as Dr. Lori Goff, the Director of the Paul R. MacPherson Institute, and the Office of Community Engagement, in particular the Director Dr. Sheila Sammon, Dave Heidebrecht, and Jay Carter for their continued support of our program. Finally, I would like to thank the members of our teaching team, including Beth Levinson, Kyle Ansilio, and Abbie Little, as well as our Student Partners, Mariam Elsheikh, Abigail Hudecki, Sarah Moodey, Swaleh Owais, and Valentina Villate. The teaching team and the student partners are a dynamic and engaging group who mentored the participants of MacChangers over eight months, encouraging them and supporting them as they created real-life solutions.

Cam Churchill
Director of the MacChangers Program

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Fenband: A Detection Approach to Fentanyl Overdose Prevention

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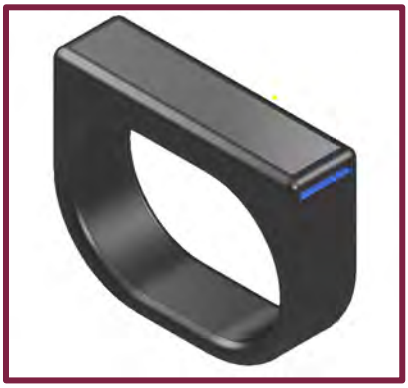

A Wristband That Users May Wear To Store Fentanyl Detection Strips
Photo Credit: Alexander Mo

Problem Identification

Hamilton is at the center of a nation-wide public health crisis reporting 110 suspected opioid overdoses between January and March 2020.[2] Hamilton's opioid related death rate is 48% higher than Toronto's, and twice the provincial average.[5] Two-thirds of participants in a Massachusetts opioid withdrawal management program reported being accidentally exposed to fentanyl, only realizing afterwards it was present in the drug they took.[3] The current Hamilton Drug Strategy program focuses on increasing overdose revival rates through a wider Naloxone distribution to non-OPA pharmacies yet has not included fentanyl detection strips.[1] Harm reduction studies in the US and Vancouver find that fentanyl detection strips lead to positive behavior changes with 45% of users consuming less after fentanyl was detected.[3,4,6] More than 80% of drug users expressed interest in detecting the presence of fentanyl.[4,6] This approach has been successful in Vancouver and aligns with Hamilton's harms reduction goals.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Overdose Prevention prioritized first, implementation of fentanyl detection strips
- Accessibility to street drug users, a portable storage device
- A mini harm reduction platform, more add-on functions such as an SOS button and Naloxone patch storage compartment to come in the future
- Align with Hamilton's Drug Strategy

Proposed Solution

Building upon promising results from studies on the effectiveness of fentanyl detection strips as harm reduction tools in the US and Vancouver, we propose a similar strategy for Hamilton. Offering fentanyl detection strips aligns with Hamilton's Harms Reduction goals to reduce overdoses and the stigma around opioid addition. Currently, fentanyl detection strips are available in single-use, brightly colored packaging. This packaging calls attention to the user and limits the number of strips that can be carried. Fenband is a bracelet modeled after a Fitbit, which carries multiple strips discreetly and safely, allowing the strips to be on the user at all times. Fenband would protect the chemical integrity of the test strips insuring its reliability. The goal of our design is to encourage the use of high-quality test strips without stigmatization in order to reduce the occurrence of overdoses. We propose a small-scale pilot that would distribute Fenbands and strip refills at an existing safe injection site. This proposal aligns with the Hamilton Drug Strategy to enhance anti-stigma practices and policies as well as to reduce overdoses. By preventing accidental overdose, we hope to reduce the demand for Naloxone and paramedic calls, thereby reducing the costs to the City.

Next Steps

Upon creation of a prototype, a small pilot study will be conducted with the Hamilton municipality, within safe injection sites. We plan to slowly expand partnerships with local pharmacies and Naloxone distributors to make this device more accessible. The product's feasibility, usability, and efficacy in preventing overdoses will be evaluated, with success measured through the reduction of overdoses comparing with the group not using the strips. The cost-effectiveness of the product in comparison to the original packaging will also be studied. Future innovations of the bracelet could include an SOS button in case of overdose, and a storage compartment for the Naloxone patch as well as more versatile test strips that detect the full range of fentanyl analogs.

Addressing Public Restroom Overdoses in Hamilton

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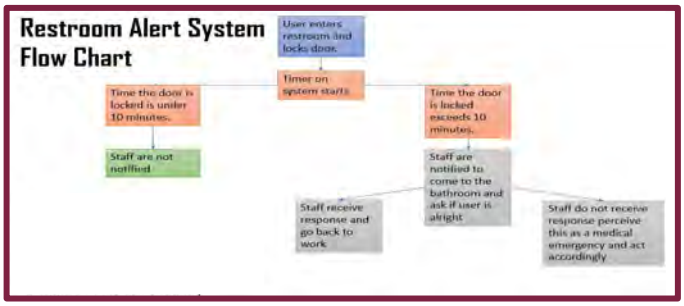

A flow chart depicting the journey of a patron into the restrooms of a small business where our proposed restroom alert system has been implemented.
Photo Credit: Farzad Haji Boloori

Problem Identification

Drug injection in publicly accessible restrooms is a known occurrence, and while quantitative research on the issue is limited, there is an abundance of anecdotal evidence that can be drawn from all of North America. These restrooms are currently serving as the setting for numerous fatal overdoses and close calls, and by default, business managers are becoming first-responders.[1] A 2017 City of Hamilton-funded study found that outside of people's own residences (76%), public restrooms (54%) were the most commonly stated location of injection drug use.[2] We conducted research with small businesses in downtown Hamilton, finding businesses who have previously observed overdoses have limited resources and must consider how their response protocol may impact other clientele. The narrow range of existing technological and elective protocol solutions can be inaccessible and/or unsuitable for some small businesses depending on their situation and priorities.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Empower staff to be aware of a potential overdose with sufficient time to execute a life-saving response
- Recognize the role of the staff, who are already multi-tasking and may fail to detect overdoses in a timely manner
- Create a signal to inform staff of a crisis immediately
- Consider the physical limitations of different spaces to both, respect the users and accessibility requirements
- Staff at restaurants would need to buy into the effort to reduce overdose related deaths

Proposed Solution

We propose a restroom time-tracking mechanism which alerts staff if a patron has been in the restroom for a long time. An alert system would reduce the cognitive load on employees, enabling staff to direct their attention towards business operations instead of actively monitoring the restrooms. Our proposed system tracks the duration from when the restroom door locks to its unlocking. If locked for more than 10 minutes, a message will be sent to employees, through the existing technological infrastructure (e.g. iPad). The message will notify them of the duration and send a reminder to check on the user of the restroom. This will hopefully reduce the number of potential overdoses from occurring in the space.

Our solution aims to increase the speed of responsiveness to overdoses, which could potentially save lives and curb loss of business due to incidence of overdoses. To address challenges with adapting to a new system, we suggest the introduction of a grace period with regular monitoring to assess the implementation of the product, in addition to a line of communication to relay feedback to make necessary adjustments. To account for privacy issues, we will work with the business to create a communication strategy for customers.

Next Steps

Our immediate next step is to develop a low-fidelity prototype of the restroom alert system, within a restaurant containing an existing overdose protocol to scale up their response strategy. After presenting this iteration to the partner business, we will work with them to develop a cost-effective high-fidelity prototype, which will then be piloted in-store. Our future steps include creating a detailed plan for the pilot program; reviewing and evaluating the performance of the prototype; applying necessary modifications to the next iteration of the prototype; creating a financial sustainability plan; and generating a plan to scale-up.

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Implementing Automated Access to Harm Reduction Resources for Opioid Users

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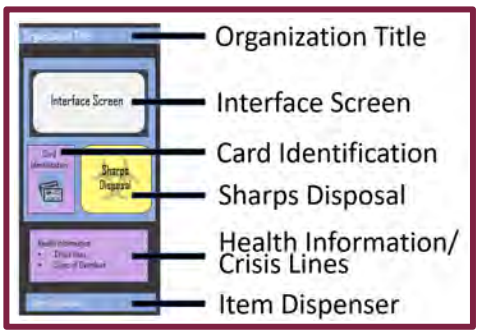

Representation of the Dispenser. It will look like a vending machine. Health information and such would also be on the sides of the machine
Photo Credit: Sarisha Philip

Problem Identification

The opioid crisis is a global issue impacting millions. Everyday in Canada roughly 12 people die from an opioid overdose[1]. Compared to the rest of Ontario, Hamilton's opioid related death rate is more than double the average of every other city combined.[2] Most of Hamilton's six needle exchange sites are closed during nighttime hours. This closure reduces access to harm reduction resources which, results in opioid overdoses and deaths.[3] Hamilton's hospitals have the highest rates of opioid-related visits and admissions, double the provincial averages.[4] The hospitalization rates continue to increase yearly creating overcrowding in Hamilton's hospital emergency system.[4] It is evident that increased distribution of overdose products can prevent opioid-related deaths, so there is a push to distribute supplies to the community and improve accessibility.[4] Providing harm reduction resources for users is the first step to relieving the harmful effects of the opioid crisis.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Increase access to harm reduction resources to opioid users during off-peak hours
- Reduce the need for emergency services and/or staff operational costs to improve cost efficiency for the City
- Be accessible and easy to maintain and restock in order to allow the greatest venue for access to resources
- Ensure that it doesn't increase stigma surrounding opioid users, as that would result in opposition towards the device's implementation

Proposed Solution

The proposed solution is an automated dispenser that provides harm reduction resources for opioid users at nighttime, including clean needles and syringes, naloxone sprays, condoms and lubricant, alcohol wipes, sterile gloves and acidifiers. Ideally, this machine will be outside a well-established harm reduction clinic to allow for maximum use with minimal public disturbance. By working in collaboration with a pre-existing clinic, clientele can readily use the dispenser which would ultimately aid in alleviating the workload during open hours. The device is accessed with an anonymous scanner card, which users can obtain from the partnered clinic/organization. Theoretically, this system allows the machine to monitor inventory, user count, and allows examination of potential misuse. The machine also has a built-in sharps container to minimize improper disposal. To further assist users, a short video or graphic demonstrating how to use the chosen item will play. After receiving supplies, users are prompted with a short survey asking them to rate their experience and overall dispenser helpfulness (out of 5). In the following months, partnered staff will be surveyed about its helpfulness, observed user experience, and change in clinical workload.

Next Steps

After approval, a manufacturer and designer capable of creating and maintaining the dispenser must be recruited. Additionally, a harm reduction organization willing to implement the machine would need to be contacted. Next, the assessments would need to be conducted to determine if the pilot is being used appropriately (i.e. providing assistance during closing hours and reducing the clinic's workload during open hours). Finally, the machine's impact should be evaluated by surveying local businesses about changed perceptions of harm reduction. If successful overall, the service can be expanded to 24-hour operation and added to additional clinics or healthcare facilities.

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Developing an Accessible Real-Time Emergency Room Wait Time Platform

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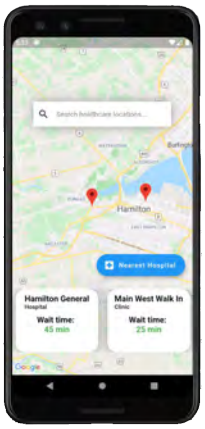

Home screen of the WaitER app
Photo Credit: Luka Mircetic

Problem Identification

Congestion of hospital emergency rooms (ERs) is a challenge that Canadian hospitals have faced for years and it is not one unfamiliar to the Hamilton community. ER congestion and prolonged wait times prevent people from receiving the urgent attention they need. The issue stems primarily from a multitude of economic and systemic factors including a shortage of hospital beds and long-term care allocation for patients.[1] These wait times are not only long, but they are also not accurately recorded or communicated reliably to the public. Failure to adequately communicate this knowledge can further congest these facilities because patients are not aware of their wait estimates. The proposed solution aims to provide this information in an accurate and timely manner, keeping people aware of wait times at Hamilton healthcare institutions and catering to their dynamic and rapidly-changing needs.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Be easily accessible to everyone
- Have accurate data to show real wait-time
- Be adaptable to the changing needs of ERs
- Expand to emergency rooms across Hamilton

Proposed Solution

The proposed solution is to develop an initiative that will allow users to view the wait time at hospital ERs in real-time on a mobile and web-based electronic platform. The platform will display current wait-times per level of severity, and it will also predict future wait times based on previous data gathered. This platform will serve as an effective solution to reducing congestion at ERs by allowing people to make more informed decisions, as it is a way to reduce the inflow at already congested hospitals and divert those to other hospitals that are not experiencing as much congestion. This solution is reliable, very accessible for the user, and it follows the goals of the Canadian Medical Association of increasing the use of health-related big data. The proposed solution will not only prevent individuals from waiting in the ER for an outrageous amount of time, but it will also increase the overall efficiency of the healthcare system.

Next Steps

In order to effectively implement this project, it must fulfill the following goals: include technical refinements, expanding outreach, and gathering increasingly accurate data. This provides an increased potential for growth. As more health care centers are included, software developments are made, and it expands to more platforms, maximal product efficiency can be achieved. This is further achieved by refining the prediction algorithm in order to account for drastic changes in the ER environment as well as the presence of external stimuli. To do this outreach to various ERs, clinics and health care centres is required with the expectation of including as much data for the public as possible. This makes it possible to eventually expand to hospitals across Hamilton, and potentially across Ontario and beyond.

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Sprout: Hamilton's Information Hub for Prenatal Services

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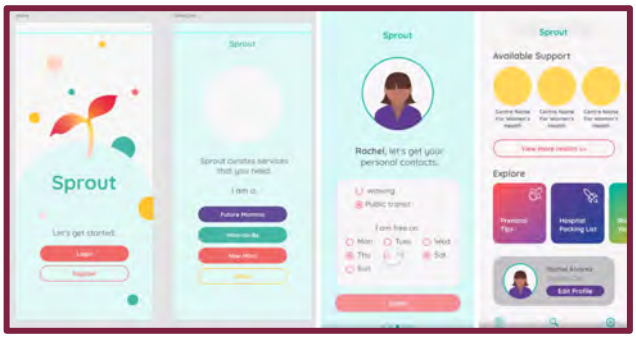

User Interface Layout of Sprout
Photo Credit: Longxi Lin

Problem Identification

Prenatal services in the Hamilton community are not easily accessible, especially to the vulnerable pregnant women population. The lack of accessibility is due to poorly conducted and unregulated information networks that fail to communicate the present state of prenatal services to the Hamilton population. Research indicates that there is an abundance of information available on prenatal services; however, it also shows that many are unaware these services exist.[1] The current system in place to inform the public on these prenatal services is outdated, as it relies on word of mouth and flyers. This system makes the navigation of information on prenatal care services inefficient. The issue is further exacerbated when the target audience of vulnerable pregnant women face logistical and social barriers. As a result, there is immense difficulty associated with finding services that are specific and tailored to the individual's needs.

Solution Description

In order to effectively solve this problem, a solution would have to:

- present specific prenatal services tailored for the client
- be accessible to the vulnerable pregnant population in Hamilton
- be cost free to the end user
- present up to date information

Proposed Solution

Sprout provides a centralized hub, represented as a mobile platform, that provides pertinent information personalized to each user. The profile evaluates various factors including preferred language, financial constraints, and modes of transportation. It is important to note that users can choose whether or not to answer prompts presented on the platform. Leveraging natural language processing and state-of-the-art machine learning algorithms, Sprout converts the client profile into actionable insights about where to receive prenatal care, how to get there, documents to bring, and possible government support (bus passes, reimbursements), among other details. This minimizes the effort and time required to seek prenatal care. Additionally, prenatal firms can save costs incurred to uphold advertising infrastructure and administration. Our platform consolidates firm's infrastructure spending into a single cost. Participation on the platform at scale will translate to anonymized healthcare big data which may then be used by government or think tanks for informed and targeted decision making on healthcare infrastructure planning among other relevant applications. An indirect value added is the savings the Hamilton healthcare system will accrue as a whole due to more preventative medicine available during prenatal periods in order to reduce postnatal and life-long complications.

Next Steps

Our next steps would include becoming part of a support network of entrepreneurs and mentors that can help guide us into a successful business. We want to improve our skills that are essential to a newly formed organization by attending workshops. Such skills include market planning and strategy as well as legality. Particularly, it is imperative that we understand how to form a contract with prenatal organizations and how to manage personal healthcare data. Our long-term vision is to expand into other medical related fields. By establishing ourselves in Hamilton, we will lay the technical foundations required to extend our customer segments.

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Menstrual Equity Pilot Project in Hamilton

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A mock-up of the media kit
Photo Credit: Audrey Wu

Problem Identification

Inadequate access to menstrual hygiene information and products is a global concern. Women spend the high lifetime cost of $6,000 on menstrual hygiene products.[1] Furthermore, while there is currently little research on information on menstruation in Canada, given that 71% of adolescent girls remain unaware of menstruation until their first menstrual cycle in low to middle-income countries, one can expect similar concerns in areas of high period poverty such as Hamilton.[2] Due to a lack of awareness about periods, menstruators often don't prioritize them as essential health needs and discussions about periods are shrouded in secrecy, causing stigmatization and perpetuation of misinformation. Menstruators often use old cardboard instead of pads, leading to urinary tract infections and skin irritation, thus posing a public health problem.[3] Although a pilot project providing free menstrual products is launching in Hamilton, these products will be ineffective unless accompanied by information on their proper usage.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Provide barrier-free access to crucial information about menstrual health and hygiene management
- Provide barrier-free access to menstrual hygiene products in public spaces
- Increase the capabilities of those in need to practice good menstrual hygiene by providing reliable information about how to safely use the provided products
- Address the root issues of menstrual inequity by reducing stigma around menstrual health so that government systems can implement more accessible menstrual products

Proposed Solution

A proposed solution that aims to improve menstrual equity would be to contribute to the Hamilton Menstrual Equity Policy Pilot Project, which has been recently approved by the Hamilton Board of Health[4]. After conducting a literature review on menstrual hygiene, a 2-3 page media kit with graphics and images will be developed by our team in the next month to deliver information on how to practice good menstrual hygiene, personalized for different vulnerable populations and age groups. Attention will be paid to the use of terminology to help combat negative, entrenched ideas about menstrual hygiene. Additionally, scholarly research will be conducted to outline in detail the criteria that must be met by the pamphlet for it to serve its intended audience. This will accompany the distribution of menstrual products from food banks and other community organizations (done by pilot project partners), so that those who get access to menstrual products are able to use them correctly. Through the provision of free menstrual products and informational resources, menstruation can be normalized and safe menstrual hygiene practices will be more accessible.

Next Steps

To promote menstrual equity beyond the proposed solution, an application for the McMaster Okanagan Special Project Grant has been made to fund a year-long pilot project for the provision of menstrual products and the designed informational resources in high traffic bathrooms in the McMaster University Student Centre. Currently, there are only two places in which students can access free menstrual products on campus, both of which have limited supply. Thus, low-income students have limited access to products. Implementing the provision of menstrual information and products at McMaster is an important aspect of long-term advocacy for menstrual equity in the community.

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The Hamilton Homeless Hub: The Go-to Resource Hub For Housing Needs

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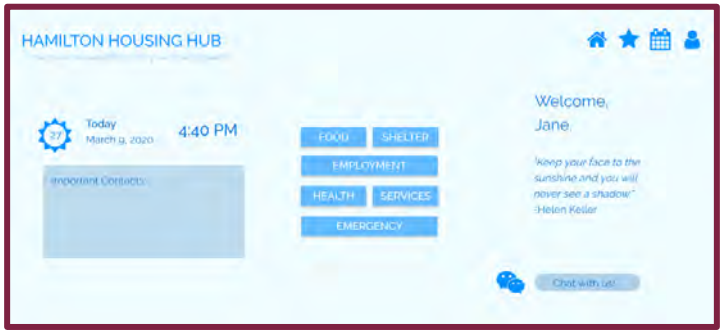

Prototype of Website
Photo Credit: Noorisah Khan, Aroushey Saeed, Adams Huang, Nour Alsafadi

Problem Identification

The internet can be an invaluable resource, however, to some it can be difficult to find the most relevant information to them. Such is the case when anyone experiencing homelessness tries to search for the variety of services offered by local shelters, government resources, or other not-for-profit organizations. Our project, The Hamilton Homeless Hub, focuses on homeless women and their access to online relevant resources. Information such as available local beds, emergency contacts, health services, and drop-in programs can be difficult to navigate, which can hinder the efficacy of the organization in reaching their target demographic. Providing homeless women with reliable, and easily accessible information can help to reduce the risks of robbing, abduction, and even death.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Provide important resources in one online location
- Be easily accessible and user-friendly
- Be updated regularly with the most recent and relevant information
- Make all important information available in an easy to understand manner

Proposed Solution

The Hamilton Homeless Hub will allow for accessible and real-time information on the current housing needs for women living in Hamilton. This would be achieved by using a regularly updated public website showcasing important information and updates such as mental and physical health, shelter rooms available, food vouchers, employment opportunities, health services, emergency contacts, and information for help. This website is the most effective solution as it is quick, reliable, accessible, cost efficient, and can incorporate all the information from resources that are already available. Additionally, a search bar will be built into the site to help users navigate their specific needs. With this website, homeless women can stay updated with their position on waiting list as well get some of their agency back. We can test the viability of our solution by posting pop-up surveys on our website so that women can provide feedback on the site and can leave their comments for improvements.

Next Steps

In order to implement the Hamilton Housing Hub, we will need to partner with a library or a local charity, such as Good Shepherd, to encourage regular maintenance of the website. We will ask community partners for feedback and updates as needed. In essence, our team will be split into two teams, research and website development. The research team will collect the information to put on the website by speaking with community partners, as well as evaluating/incorporating already available resources. Moreover, the website development team will look at how to make the website as user-friendly and accessible as possible as well as building the site.

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A Web App to Alleviate Social Housing Issue for the Hamilton Homeless Population

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Problem Identification

As reported by the Hamilton Spectator, Hamilton's social housing waitlist continues to grow as the municipal government struggles to maintain its existing units.[1] In September 2019, there were approximately 6,860 applications on the waitlist and the number is projected to increase to 10,000 by 2023.[1] Through the existing "Access to Housing" application, CityHousing Hamilton provides a list of all of the subsidized housing properties and a static map showing areas where subsidized housing exists.[2] However, it does not show the exact locations of housing units on the map and applicants would know which ones are available in real-time.[2] As indicated by the Good Shepherd, an appropriate and effective system to provide applicants access to information on available subsidized housing information is needed.[3]

Solution Description

In order to effectively solve this problem, a solution would have to:

- Ensure that the application is interactive and allows users to discover all of the available subsidized housing units on a web map
- Ensure that the application is informative and replenishes important information, such as unit availability, bedroom sizes, household type, elevator & wheelchair accessibility, nearby services, and photos
- Ensure that the app is user-friendly, accessible, and available to use on iOS (Apple), Android and Personal Computer devices

Proposed Solution

The proposed solution is to create an ArcGIS Online Mapping phone application that will be available and accessible to those seeking subsidized housing. The application will be made available on iOS (Apple), Android and Personal Computer devices. Each subsidized housing property will be geocoded and digitized as a polygon feature on the base map, showing locations for all of the subsidized housing properties. Available subsidized housing units will be classified and colour-coded differently based on their building types, whereas the occupied housing units will be grayed out. Users will be able to zoom in and out of the view and tap or click to check important attributes for the interested housing units, such as the number of units remaining, bedroom sizes, household type, wheelchair and elevator accessibilities, nearby services and photos. In addition, users can filter the available housing units based on these attributes. Information on location proximity to pharmacies, restaurants, grocery stores, and HSR bus stops will be incorporated into this web application. This web application would enable users to visualize the availability and accessibility of essential services near the available housing unit.

Next Steps

Our next steps include scheduling a video or audio meeting with Good Shepherd through Microsoft Teams to seek suggestions in designing the web application. Then, data would need to be collected for all of the subsidized housing locations in Hamilton, spatially joined to Hamilton's building footprint and replenishing important information as attributes. Lastly, the data/layers would need to be input onto ArcGIS Online, customizing the widgets (functionalities) and publishing as the web application.

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Out Safe—A Website for Women in Hamilton to Access Domestic Violence Support

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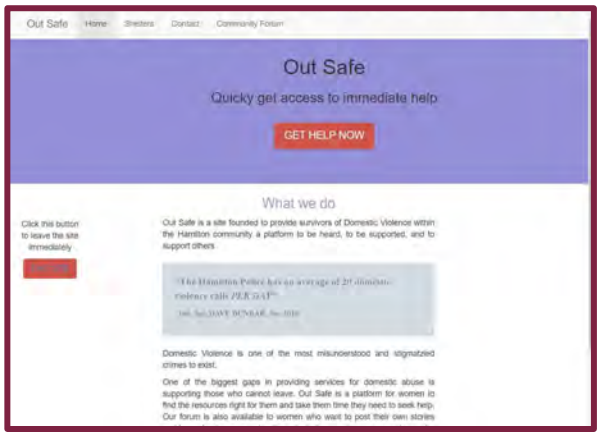

Homepage of our website prototype
Photo Credit: Aislyn Sax

Problem Identification

In Hamilton, there are approximately 20 calls about domestic violence each day. Despite the high prevalence of domestic violence in Hamilton, there is a lack of discrete ways for victims to seek support. Our online research has shown that the resources available are primarily hotlines and shelters to get victims out fast and safely. However, decisions to access these services could be life altering and many women may not be ready to make these decisions. Continued support is needed for such women who are not ready to leave their relationships, by providing them with information on shelters and other resources such as virtual support from fellow survivors. Our website, Out Safe, aims to foster understanding and offer support with the safety of anonymity.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Have accurate and readily available information
- Be on an easily accessible and easy to navigate platform for all users
- Build an environment of trust amongst vulnerable populations
- Ensure confidentiality so no user is traceable

Proposed Solution

Our proposed solution is to build a website which serves the dual function of empowering vulnerable women and providing them with easily accessible resources for domestic violence support. The website will offer two key features: (1) a forum for the individuals to anonymously share their experiences and connect with others in similar situations; and (2) a map displaying community resources, such as shelters and other support outlets. Programming and hosting the website will require investment and would require advertising expenditures. These expenses could be covered by generating advertisement revenues on the website wherein the advertisements are relevant to women empowerment (ex. Martial arts program advertisement). One of the main considerations would be to facilitate confidentiality and respect of privacy, ensuring that the user feels safe in accessing the website. To minimize unintended consequences in the implementation process, a few steps will be taken to ensure that the confidentiality and respect of privacy are of the utmost priority. The forum of the website would be community moderated. Users themselves report spam or inappropriate posts. We will focus on a target population within Hamilton.

Next Steps

The next steps are to build the relationship with shelters and gather information on the types of resources they offer. This would be important in building a prototype. To ensure that our solution is making an impact we will use a combination of website traffic metrics and a survey for users to respond with their input to improve the services provided. Additionally, we would like to explore creating an online connection program that connects individuals with lived experience to individuals currently looking for assistance. This would help facilitate engagement and encourage users to build support systems.

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InSight: Visualizing Care Networks for Youth in Hamilton

Student Authors

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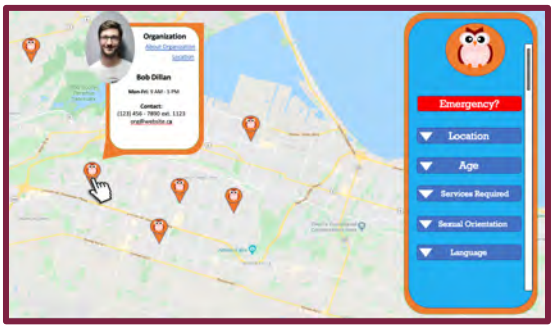

Web Interface for InSight
Photo Credit: Samuel Koo

Problem Identification

It is estimated that 6.7 million Canadians will experience mental illness or addiction in a given year.[1] However, the current healthcare system is not meeting the needs of young Canadians. An estimated one in five Ontario children and youth have a mental disorder, but less than one-third have contact with a mental health care provider.[2] Furthermore, there is little collaboration between healthcare and other systems related to mental health, such as social services, housing, employment, and education. Patients with complex mental illnesses end up being cycled through the acute care system with inadequate support, care, and follow-up.[3] Given that Hamilton is experiencing rising levels of youth affected by mood and anxiety disorders, there is an evident need to improve navigation of mental health care.[4] The proposed project attempts to connect youth in Hamilton to the care that they need in the face of a complex, fragmented system.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Connect the user to the most appropriate service for them at no cost
- Be accepting of different cultures, languages, mental health problems, and sexual orientations
- Be accessible and user-friendly without foregoing anonymity through the search process
- Be constantly maintained to provide up-to-date information

Proposed Solution

Our solution, InSight, aims to create a visual map of the mental health care ecosystem for Hamilton youth aged 16 – 24. Data will be populated into a directory, displaying mental health services through an interactive display, focusing on community programs, organizations, and social services. The information will be sorted using an interactive panel by users to filter services based on location, age, specific services required, sexual orientation, and other self-identifying factors. Short-term and long-term associated costs will stem from website population, development, and hosting, but will be offset by revenue from website advertisements and licensing agreements to distribute the map to other organizations. Barriers to implementation arise from accurate and complete data population, as well as strategic market positioning to establish user compliance, and public skepticism that an interactive map will make searching for services easier. It is proposed that the map be piloted with community organizations, where direct user satisfaction can be accurately measured through quantitative feedback, website traffic, and the number of referrals made by community partners using the map.

Next Steps

The next step in our plan is to complete the second stage of our pilot. This second stage would involve the expansion of our database by mapping additional programs and services. Once a suitable database is established, we would move forward with the development of our website working alongside a developer. We will acquire funding through potential community partners and grants. Feedback from community partners would be taken in regular intervals and suggestions for improvement would be highly encouraged. The website could be maintained by a qualified representative.

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Walkpool: A Walk Home Program to Increase the Perception of Safety in Hamilton

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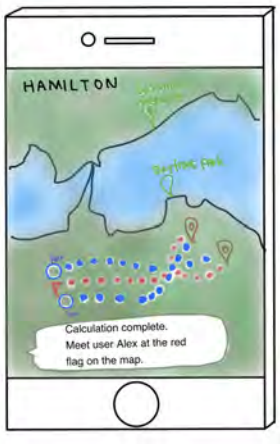

Initial user interface design of the 'Walk Pool' while the system is searching for another commuter, and calculating the shortest route to destinations.
Photo Credit: Firoza Mierxiati

Problem Identification

The perception of safety for people in Hamilton is a prominent issue. According to 'Numbeo,' a survey-based website, over 100 people have voted that they have concerns about their safety walking alone during night time. Moreover, the crime rate in the downtown Hamilton area has been increasing for the past 3 years.[1] After conducting interviews with local students and staff who live in the downtown Hamilton area, it was noted that they were also concerned about their safety and encounters at night time. Specifically, we identified that many students use public transportation at night and feel unsafe walking between the bus stop and their homes. This information provides tremendous value to all the potential demographics in the Hamilton area, including elementary school students, working women, etc. Walkpool would provide a solution would benefit the public to be more relieved from discomfort to walk to other places at night time.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Easy to use and cost-free to all people
- Increase the safety awareness to the community
- Must be accurate and reliable
- Provide protection to public's privacy

Proposed Solution

'Walk Pool' is an app designed to allow Hamilton citizens to share their real time locations with the system and calculate the shortest and safest route to walk to similar destinations as a pair. To ensure all users safety, new users are required to verify their identity in the system. A rating and review section is added for each user to enhance the user experience. The costs to improvise this solution would include: the salary for programmers to code and design the app (an average salary for a programmer is $15000, but may vary depending on the size of app), and advertisement on platforms like Facebook and Google ($2000 a month).[2,3] To overcome the constraint of investment incentives, appropriate marketing methods such as advertising will be used to increase the user base. Furthermore, with an ease of entry to the digital market, new entrants can quickly replicate the format of the app, leading to a decrease in user's demand for WalkPool. The measure of success in the future will be based on the increased number of users in a certain period of time, and the increase of users' perception of safety.

Next Steps

For our next steps, we will be working with some upper-year computer science students, professors, and staff from the university technology services to develop and complete the codes for our app. This includes: executing the essential function, such as calculating the shortest route and users' privacy protection. We will also conduct some phone calls and online video calls to software designers to have our interface design complete. Moreover, we will be reaching out to McMaster Student Walk Home Attendant Team to test our app on McMaster students before officially launching it to the public.

Hamilton CityApp Emergency Module

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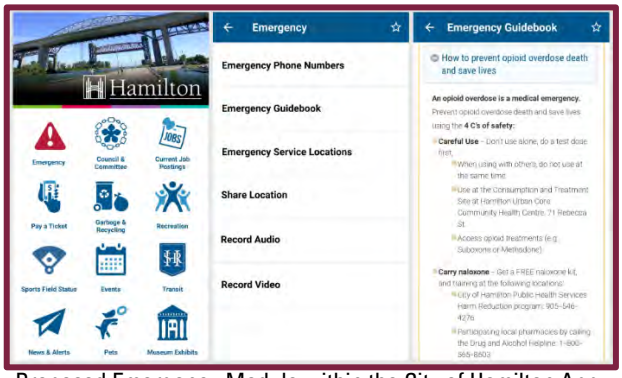

Proposed Emergency Module within the City of Hamilton App
Photo Credit: Elishia Diokno

Problem Identification

In 2017, an article investigating Canada's Most Dangerous Places demonstrated that Hamilton has higher homicide, sexual assault and robbery rates of 2.14, 75.93, and 87.88, respectively, compared to the Canadian averages of 1.68, 56.56, and 60.09.[1] Additionally, Hamilton had the highest rate of police-reported hate crimes in Canada in 2019.[2] These statistics suggest not only increased rates of crime in Hamilton, but also an increased number of people who may be wary of the city due to reports of these crimes. This wariness contributes to the negative stigma surrounding the city, reducing community engagement, foot traffic to local businesses, and interest in Hamilton housing.

The existing solutions to this problem include a website sponsored by the Hamilton Police which geographically depicts the areas where crimes have recently occurred. Although this solution is very informative, it is not helpful in preventing crime and ensuring safety in Hamilton.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Contribute to the improvement of the safety of Hamilton
- Not promote any negative stigma surrounding Hamilton's safety
- Be free and easy for anyone to access and use with a platform for user feedback
- Operate within municipal, provincial, cyber, and business laws

Proposed Solution

We propose the introduction of an additional module to CityApp, the City of Hamilton app, that directly addresses safety in the city and how to respond during emergencies. This would include a list of emergency numbers, an emergency guidebook, and a live map of the closest emergency services. The app would allow for easy access shortcuts/widgets to be made available on the home screen of the user's phone for emergency phone calls, location sharing with friends, family, or local authorities, and a video/audio recording automatically shared to a database accessible to local authorities.

Implementing this new module would be inexpensive, as an existing employee could modify the code to add emergency information and widgets. In the long term, it would similarly involve minimal costs related to adding responsibilities to Hamilton police, like the database and shared location monitoring.

Having access to the information in the guidebook and the emergency phone numbers/services in the module will help users be more prepared to respond to emergency situations and call the relevant authorities, which can help in the handling and prevention of crime in Hamilton. The success of the solution can be measured through the user feedback platform already present in CityApp.

Next Steps

Our recommendation for moving the project forward would be to submit our proposal to the City of Hamilton website, where they have a form for any suggestions regarding the application. If the proposal is accepted by the CityApp team, they would also have to update the user policy of the app to request user permission for the app to access the phone's location, contacts, phone, camera, and audio. We will also include our contact information in our proposal so that we can work together with the CityApp team to incorporate the Emergency Module into the app.

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Connect 2 Campus: Helping McMaster Students Find Housing

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The Logo and name of our app
Photo Credit: Tammy Li

Problem Identification

Every year, more students crowd the house-hunting market around McMaster. Our team conducted a survey indicating that approximately 75% of students feel rushed and stressed when scheduling viewings due to an increase in competition.[1] Furthermore, many of the students that rent off campus live in other cities that require them to travel long distances in order to view rentals. If they are unsuccessful finding a house, time and effort are wasted. Not being able to find a house increases stress and rushes students to rent houses that are overpriced and overcrowded.[1] Our proposed project is to create an app that streamlines house hunting for students. Our app, Connect 2 Campus, will allow students to plan viewings for potential rentals with ease, and for landlords to update and track their advertisements. Connect 2 Campus is aimed at increasing house-hunting efficiency for students by helping them find a suitable rental at a reasonable price.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Accommodate all users by employing ease of navigation and usage
- Provide and maintain a high quantity of listings while staying within legal confines (reproduction of content, intellectual property) of other third-party search avenues
- Support a high degree of transparency between landlords and potential students
- Improve overall efficiency and promote the relationship development between landlords and potential students

Proposed Solution

We are proposing a web application that encompasses features that simplify the matchmaking process for both students and landlords. Our proposed app would relay information between both parties, students and landlords, in real-time so that they will always be aware of the current status of the house leasing process. Benefits to the students include house viewing schedules and push notifications regarding the status of houses that they are interested in. The project would require initial investment in development and marketing to ensure the apps viability and that the product can be used by everyone. After the initial product is released, the application would be mostly self-sufficient, with the main revenue sources being able to cover the post-release costs of maintenance. Such revenue sources will include, but are not limited to, mobile advertisements and service fees. The scope of the project's success will be constrained to the students and landlord's willingness to use a new avenue for house posting and leasing. Given the limitations, the solution's success will be determined by feedback from the initial landlords who use our platform, as well as the growth in student use over the span of one year from the initial release.

Next Steps

As the immediate next step, the team would need to finalize design by developing Unified Modelling Language (UML Diagram) to visually represent the system and establish relationships between classes, attributes, and operations. Following that, our team would need to acquire domain, develop the website, and control quality. In conjunction with Engineering, the marketing team would develop strategies to attract landlords and management agencies to the product and proceed to advertise listings to market. Seeking revenue sources, the marketing team will initiate the process by contacting advertising agencies. Preceding product launch, management will track performance by evaluating traffic (e.g. units rented) as well as qualitative user surveys to assess experience over time.

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Hotspotz: A Construction Mitigation Tool for Business Areas

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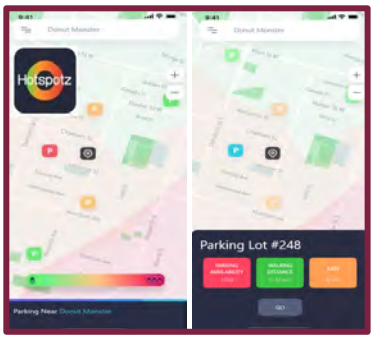

Results for street and lot parking on mobile application
Photo Credit: Haseeb Siddiqui, Tressa Mastroianni

Problem Identification

Currently, Hamilton is projected to house 626,300 people by the year 2026 which is almost 60,000 more than what was recorded in the year 2018 (568,000).[1] The city is preparing for this influx of people by building housing which results in construction sites, often in areas surrounded by local businesses. That, coupled with the cancellation of the LRT project, will result in a parking problem in the downtown core since customers will be forced to drive to get to businesses. This problem is also fueled by developers not wanting to convert their empty and unused land into parking lots in hopes of selling the land at a premium or building expensive housing comparable to Toronto's luxury apartments, as described by our community partners.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Have a maintenance cost which can be equally shared among stakeholders
- Be scalable to various business areas
- Provide accurate/updated parking information
- Communicate construction restrictions
- Collect reliable data for proper implementation and analysis

Proposed Solution

Our proposed solution is to provide real-time data about street and lot parking for customers of business areas under construction. This requires the use of a mobile-based application that leverages maps and predictive analysis artificial intelligence. In the app, parking availability surrounding businesses will be displayed via a heat map and continuously update as customers provide information about their own parking status and the nearby area. Construction project managers will also be able to update the map with street restrictions and post on a "construction news feed". This application will decrease uncertainty about parking and streamline the ability to communicate construction information.

To cover estimated costs of $40,000-$60,000 for initial development, we believe government investment is required. Following development, maintenance costs will be covered by revenue received from a subscription service that Business Improvement Area (BIA) boards and customers choose to subscribe to. Upon subscription, customers will receive discounts on parking and BIAs and lot owners will be reimbursed accordingly. Success will be measured based on customer satisfaction and the number of app users, as well as revenues collected by BIA members during times of construction. Constraints involve limits to those without mobile devices, and dependence on user input.

Next Steps

Funding must be secured for this application to be developed. Following this, a development team must be put together to design, develop, and test the application. This team would also be required to work with parking lot owners and BIAs during development to provide app users with the monthly parking subscription at discounted rates. As a final step, relationships should be built with businesses to provide advertising services on the app. This will allow the product to be financially sustainable and a source of revenue for further development.

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Reducing Paper Receipts in Local Businesses in Hamilton

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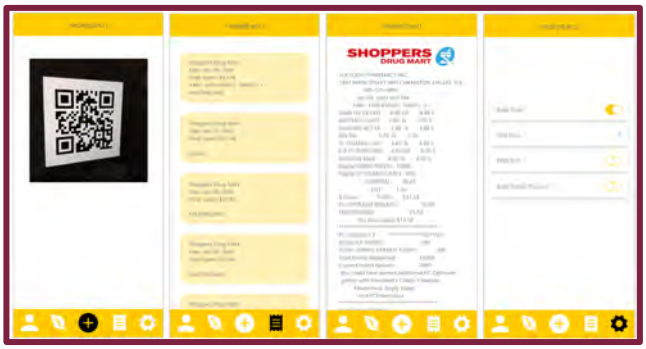

Design concept of application for the proposed solution
Photo Credit: Utsharga Rozario

Problem Identification

Paper receipts have huge negative environmental impacts. Receipts are not recyclable and generate a significant amount of waste; annually in the US, receipts generate 300 million pounds of waste and 4.5 billion pounds of CO_2.[1] Most thermal/phenol paper receipts are coated with the chemical BPA or BPS, which have been shown to cause reproductive, neurological, and developmental problems when absorbed through skin when handling receipts.[2] The receipt paper itself is expensive, costing businesses hundreds or even thousands of dollars a year. Receipts also have issues for consumers; physical receipts deteriorate quickly, and one study showed that 74% of consumers would prefer to receive all receipts digitally.[3] Existing digital solutions typically require consumer emails, but a study showed that 62% of consumers are concerned about their private information when stored electronically.[4] Thus, a solution is needed that combats the health, environmental, economic, and privacy issues with existing receipt systems.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Reduce printing of toxic paper receipts, thus reducing their environmental and health impacts
- Save businesses money and potentially make them a profit
- Be easy to implement for the consumer (i.e. not take more time than waiting for receipts currently takes to not make the solution inconvenient)
- Protect consumer's private information
- Replace paper receipts with digital ones, ensuring proof-of-purchase if needed for tax purposes

Proposed Solution

Our proposed solution involves integrating a digital receipt interface, including a tablet screen and a smartphone application, with existing point of sale (PoS) systems. Instead of printing a paper receipt, a QR code will be generated on the tablet screen and will be saved in the smartphone app. Printing a paper receipt would still be optional for customers without smartphones. Otherwise, scanning the QR code will bring up key information about the purchase as text on their phone, such as total cost and transaction information, which can be saved by taking a screenshot. To ensure user privacy, consumers would not be asked for personal information, such as an email, as the app would save information locally on the smartphone. The costs of our app would be covered through a subscription structure for businesses. The subscription fee would be cost-effective, as reducing receipt printing would save money overall. The success of our solution would be measured by tracking receipt printing over time, specifically looking for reductions in amounts of material used. The environmental impacts of receipt reduction and the cost savings for businesses can both be interpreted from this data.

Next Steps

The next steps would include building the application software. We would also need to reach out to the PoS companies to ensure we can interface with their systems. Once we have a fully-functioning solution, we would run a pilot project with the solution in a select few local businesses in Hamilton to identify areas of weakness. We would improve the solution, record our successes, and use them to expand our pilot out into more businesses in Hamilton.

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Designing a New Bike Lane on Cannon Street

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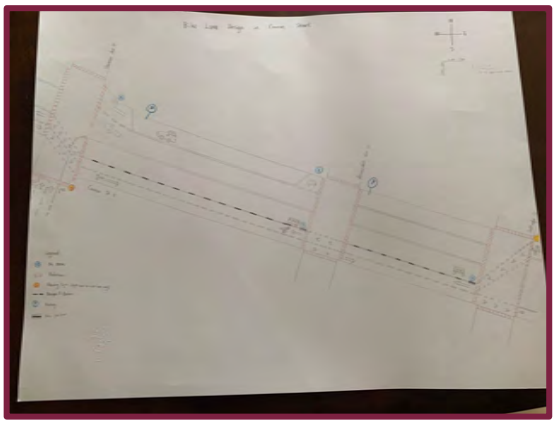

Proposed design of new bike lanes
Photo Credit: Yifan Hao, Jing Shi, Sijie Zhang, Shiyue Zhang

Problem Identification

Cycling is recognized as a better mode of transportation to benefit the environment by contributing to combat climate change. It is an important part of building healthier communities by providing a built environment that supports healthier modes of transportation.[1] Cycling on a designated bike lane is much safer than cycling on the sidewalk or shared lane with motor vehicles. A segment in Hamilton between Lottridge Street and Sherman Avenue currently does not have a designated bike lane. This portion of the street has only shared lanes for both bikes and motor vehicles and is often used as a parking space for cars. However, there are designated bike lanes in the further east and west direction of this segment. Thus, the main problem is how to adjust the road structure effectively to eliminate this disconnection of bike lanes.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Effectively increase the safety of cyclists
- Ensure cyclists and cars are both considered and appropriately accommodated
- Positively impact the normal life of local residents living beside the Cannon Street

Proposed Solution

Our proposed solution to designing a new bike lane for Cannon Street in Hamilton, Ontario involves connecting the existing gap from Lottridge Street and Sherman Avenue. To achieve this, the outer lane in the east direction will need to be constructed into a bi-directional bike lane with barriers which will allow riders to ride bikes safely. The outer lane in the west direction will be constructed into a parking lane and a separate space will be designed in this lane to accommodate the bus station. The bus station will need to be moved to provide safety for the cyclists and prevent blocking other cars. Based on research from a similar project on Cannon Street in 2014, the project will cost around $460,000 CAD. The width of the motorway and bike lane should be at least 3.0m and 1.0m respectively, which is in accordance with policies on bike lane dimensions.

The success can be measured by recording accident rate, number of riders on the bike lane, number of traffic jams, and number of complaints from all the users to determine the reliability of the design.

Next Steps

The next steps would include talking to an urban planner and having a plan of the proposed design drawn up with accurate scaling and professional layout, to create the proposal that includes accessibility and design of the bike lane into consideration. The proposal will also consider the economic and environmental impacts that the bike lane will cause. Sources of funding and effects on nearby residence will also need to be considered as realistic constraints.

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Breadalbane, Baker, and Bicycles: Closing the Gaps in the Cycling Path

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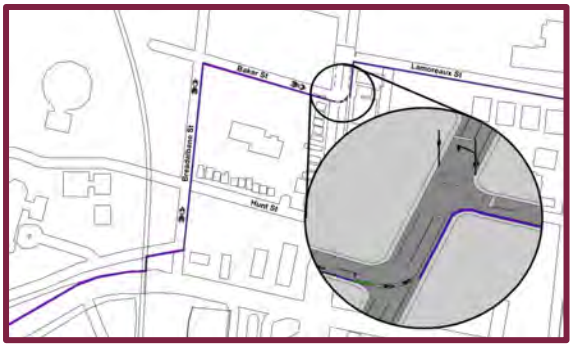
Janelle Treash, Arts & Science



Intersection Design
Photo Credit: Ian McIntosh, Janelle Treash, Haley Harrington

Problem Identification

Cycling between McMaster University and Hamilton's downtown core is challenging and dangerous: the current infrastructure guides cyclists to make an unprotected left-hand turn from Hunt St. to Dundurn St. N. Not only is this shared path highly trafficked by vehicles, but the signage directing bicycle movement is unclear and inconsistent. As a result, cyclists often circumvent the Breadalbane/Hunt path by cutting through the Esso station, or by dismounting their bikes and using the King-Dundurn crosswalk. In 2017, this intersection was named the city's most dangerous, with collision reports consistently topping the charts for 5 consecutive years.[1] Consulting our community partners, coupled with the 2018 "Changing Gears" Cycling report, we identified this section of the city as a massive cycling discontinuity and source of anxiety for cyclists seeking to travel between east and west regions of the city. If Hamilton is to encourage more citizens to utilize sustainable transportation strategies, they must rectify this gap in the cycling network by facilitating safer bicycle journeys and equitably shared spaces.[2]

Solution Description

In order to effectively solve this problem, a solution would have to:

- Create a safe and continuous cycling route through the King-Dundurn intersection that reduces the risk of collisions
- Support City of Hamilton sustainable transportation goals and encourage cycling for all ages and abilities[2,3]
- Clearly designate the established route so that cyclists can easily and safely navigate between Westdale and downtown
- Smoothly and safely integrate with existing cycling routes (on King St. W and in the Victoria Park area)

Proposed Solution

The proposed solution aims to improve connectivity between the King Street West and Lamoreaux Street bicycle paths. The first component is improved wayfinding. This would be achieved through the creation of a bicycle boulevard along Breadalbane and Baker Street which uses colour-coded lines and bi-directional "Sharrows" on the pavement to bring awareness of the path to both cyclists and drivers. The low-volume traffic that passes through these streets (i.e. < 2000 cars) makes this a feasible solution. Accompanying these markings would be wayfinding signage added to existing sign-posts at the following key intersections: King-Breadalbane, Breadalbane-Baker, Baker-Dundurn, and Dundurn-Lamoureaux. The second component of the solution is a designated box for cyclists making a left turn from Baker Street onto Dundurn Street, which would be complete with a bicycle tire sensor that activates the red light at Lamoureaux and Dundurn. The technology that automatically halts traffic for pedestrians can be extended to cyclists to aid them in making left turns without the threat of rapid oncoming traffic. This bicycle box sensor would be accompanied by a dashed lane to facilitate safe left turns that connect the Baker Bike Boulevard to Dundurn's existing bike lane.

Next Steps

The next steps would include installing wayfinding signs and pavement markings, and evaluating the effectiveness of colour-coded wayfinding markings through consultation to determine whether their use can be expanded throughout Hamilton. Next, we would need to conduct community consultations with Hamilton cyclists to determine whether the solution appropriately improves cyclists' safety and ability to navigate the area. Consulting with transportation and engineering departments to determine the best type of sensor to use at the Baker and Dundurn intersection, and the appropriate signage and pavement markings to install in the intersection, would also need to be completed. Lastly, the network of marked bicycle boulevards would need to be expanded east towards downtown to improve the overall continuity of the city's minimum grid.

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Using Non-Newtonian Fluids to Increase Cyclist Safety

Student Authors

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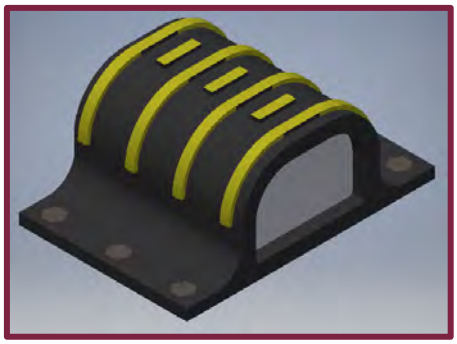

Proposed Non-Newtonian Fluid Barrier
Photo Credit: Alisa Neang

Problem Identification

Each day, thousands of citizens cycle through the roads of Hamilton to go about their everyday lives. However, with physical barriers only on 6 out of the 23 busiest cycling routes in the city of Hamilton, cyclists are at a higher risk of injury due to the fact that vehicles will pass cyclists 1.25 feet closer than if a barrier were present.[1,2] A lack of a substantial boundary leaves cyclists vulnerable to collisions and in a growing urban centre like Hamilton, this problem will only get worse if safety measures are not implemented. Both cyclists and drivers deserve to feel safe on the road. The proposed project addresses Section 3.0 of the Cycling Master Plan and contributes to the strategic priority of Healthy and Safe Communities under the Multi-Modal Transportation section of the Future Hamilton Community Vision.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Align with the Hamilton Transportation Master Plan
- Lower the risk of vehicles entering bike lanes
- Be easily maintained and implemented
- Give cyclists a sense of safety

Proposed Solution

The solution utilizes the unique properties of a shear-thickening, Non-Newtonian fluid to create intelligent physical barriers between motor vehicles and cyclists, lowering the risk of vehicles crossing into cycling lanes during operation. The intelligence of the barriers stems from the properties of the Non-Newtonian fluid (polyethylene glycol combined with silica particles) – when the barrier is impacted at a low speed, the semi-cylindrical-shaped barrier acts like a liquid and does not cause any disturbance to the transportation device, as expected for cyclists crossing into the lane. However, when impacted at a high speed (approximately 40+ km/h), the barrier will act like a solid and redirect the intrusion back into the vehicle lane as well as provide an auditory cue that the driver has veered into the lane. The Non-Newtonian solution is proposed for Leland St. in the Ainslie Wood neighbourhood, an area with high cyclist traffic due to the abundance of commuting students. Upon a successful pilot, it is expected that the number of cyclist accidents will reduce. An investment into Hamilton infrastructure and an improved physical barrier will encourage residents to bike, positively contributing to the Future Hamilton Community Vision goal of becoming a sustainable community and achieving Minimum Grid status.

Next Steps

The next step is to examine the chemical proportions of polyethylene glycol and silica particles by experimenting on their shear-thickening property. The next step will be to develop a working prototype, as proposed below, with the required materials to conduct its physical testing and determine its functionality in extreme conditions such as cold weather, repetitive usage, and environmental impact of its components. We will also collect valuable feedback from everyday cyclists on Leland St. to analyze the solution's effectiveness. Upon positive results, we will determine the financial viability of the solution with in-depth cost analysis of each component and its scale for mass application.

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RouteSure: Improving the Accessibility of Real-Time Bus Information for HSR Transit Users

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RouteSure Terminal - Prototype v.01 (up) & Screen in Development - Prototype v.02 (down)
Photo Credit: Che Su

Problem Identification

The Transit Sector in Hamilton's Master Plan listed access to real-time bus information to riders, as a goal.[3] Many of HSR (Hamilton Street Railway) users do not own mobile phones or have data service and as a result, they do not receive up to date schedule information. Due to this inequity of access to information, these riders face being late to work or appointments. Real-time information users report that their average wait time is 7.5 minutes versus 9.9 min for those using traditional arrival information, a difference of about 30%.[2] With this increased wait time caused by the lack of real-time information, riders may experience more frustration and result in a decrease in ridership.[1] The challenge facing municipalities in offering real-time data displays is the underlying cost of $2000 per display module coupled with power consumption, makes such a solution expensive, unscalable, and unreliable.

Solution Description

In order to effectively solve this problem, a solution would have to:

- Be capable of acquiring and displaying real-time transit information, in inclement weather, with an off-grid power source
- Be accessible to all HSR (Hamilton Street Railway) transit's bus riders, vandalism resistant, inexpensive, and cost-efficient
- Address HSR issues revolving around affordability and cost-effectiveness
- Address issues that act as barriers to real-time bus information faced by many users

Proposed Solution

RouteSure is a solar-powered real-time transit display system that easily integrates into pre-existing infrastructure. RouteSure instantly updates transit users with any changes in bus schedules by utilizing its GTFS*- Module, an energy-efficient LED display screen, an onboard microcontroller, weather-resistant solar arrays, as well as a built-in battery pack. RouteSure is designed to increase user satisfaction, increase ridership, decrease overall wait-times for HSR transit users, and achieve equitable transit quality for all. By providing real-time bus information and by focusing on service quality improvements, we would be able to increase transit ridership as well as user satisfaction and work towards achieving the United Nations SDG 11.2.[1,4] RouteSure has a projected cost of $1000 per unit as a result of production scalability, ease of unit manufacturing, and competitive part-sourcing. To overcome constraints related to the costs of batteries and solar panel efficiency green e-paper displays that cost less and use less power could be used. The success of our proposal will be measured by looking at user-satisfaction (surveys and ridership) levels at our initial pilot location, in comparison to those at other bus terminals in the city and the pilot location before our pilot's launch.

*GTFS = (General Transit Feed Specification)

Next Steps

The next steps include conducting a pilot at the Hamilton Mountain Transit Center for 6 months in partnership with HSR allowing us to measure the efficacy of RouteSure and its effect on ridership. Based on the results of our pilot, a second prototype may include a universal mount adapter, advertisement functionality, and a more resilient chassis. If successful, we will see an increase in display terminals and a need to scale up will become necessary. After its successful integration into the transit system, investors, transit services from other cities, and local businesses looking for advertisements will be consulted with.

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NiteLite: Improving HSR Transit Stops

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NiteLite Renderings & Prototyping
Photo Credit: Nour Ziena

Problem Identification

Weather conditions like heavy rain and snowstorms create visual discrepancies making it hard for bus drivers to identify if a person is waiting at the bus stop. Similarly, after dusk, it is common for bus drivers to miss commuters at bus stops and sometimes results in drivers making unsafe sudden stops. Additionally, positioning of bus stops inside inner and side streets exacerbates the issue. Bus stops appear to be hidden due to the lack of lighting, ultimately decreasing visibility of the bus stop. Such issues are elevated for individuals with auditory disabilities & visual impairment. These elements contribute to an unsafe commuting experience.

A survey was created and distributed through social media outlets to residents. Out of 293 survey participants, 52% of users felt unsafe taking nighttime transit. Additionally, 40% denoted that bus drivers did not see them waiting.[1]

Solution Description

In order to effectively solve this problem, a solution would have to:

- Bridge the communication gap between the user and the bus driver
- Solution must be adaptable/reliable in all-weather conditions
- Emphasize easy installation, maintenance, and utilization of the system
- Cost effective to allow for feasible integration

Proposed Solution

A device will be commissioned which attaches to bus stop poles and illuminates when an individual is waiting at the stop. Thus, indicating to the bus driver to safely slow down ahead of time and allow the user to board. The finished product will also account for those who are visually impaired by relaying information through sound such as an indicator alarm when the light activates. The result will be a device that enhances the commuter experience by providing safer nighttime travel via established communication between the bus driver and user.

The proposed project will be piloted on the Bayfront (4) bus route, specifically from Industrial Sector C through Industrial Sector G. This location was chosen by the team as it showcases multiple poorly lit and underemphasized bus stop poles.

The success of the pilot will be measured by feedback from users of the HSR, and bus drivers. The method of feedback used will be online surveys. Links to surveys will be available on Hamilton's HSR page, and a barcode attached to the piloted bus stops will also link to the survey. The measure of success will be dependent on if a majority of users provide positive feedback indicating an improved commuting experience.

Next Steps

Our next steps include **s**eeking out opportunities to speak with senior council members to discuss the implementation and feasibility of the NiteLite in the city of Hamilton. Following the discussion we would then pinpoint specific locations in the city for early adoption and testing. Concluding with establishing reliable vendors for quality & cost-effective parts.

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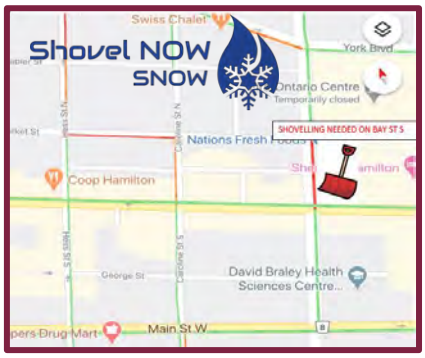
Pilot for Accessibility Mobile Application "Shovel NOW (SNOW)"



Application Logo and User Interface
Photo Credit: Karim El Khatib

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Problem Identification

There are 2400 km of sidewalks in Hamilton and only 400 km are snow plowed by the city.[1] The remaining 2000 km are governed by the City of Hamilton's Snow and Ice By-law (No. 03-296) requiring property owners and occupants to clear snow and ice within 24 hours after the end of a snowfall.[2] Many residents fail to comply and leave sidewalks uncleared which impacts the mobility and safety of pedestrians and wheelchair users. Moreover, uncleared sidewalks and improper snow removal practices restrict access to public transit and pose a barrier to the mobility of vulnerable citizens. Snow gets piled on curbs and near bus stops increasing the risk of injuries. This significant mobility challenge conflicts with the Strategic Plan, the Transportation Master Plan and the Pedestrian Mobility plan that aim to establish resilient communities in the City of Hamilton.[3]

Solution Description

In order to effectively solve this problem, a solution would have to:

- Align with the Pedestrian Mobility Plan set by the City
- Improve the quality of life and the overall wellbeing of residents
- Cost effective and feasible
- Innovative and data driven

Proposed Solution

Our proposed solution is to make a mobile application used to increase sidewalk accessibility and community engagement. The SNOW application uses crowdsourced information from vulnerable residents by giving them the ability to report accessibility issues. The proposed application allows the City to act proactively and identify noncompliant residents easier and faster than the existing bylaw complaint process. The SNOW application will improve sidewalk accessibility by pairing snow removal volunteers (SNOW Angels) and disabled residents based on their location and on their eligibility of participating in the program. The City of Hamilton has a remarkably high disability rate of 20% and 17% of the population are seniors.[4,5] Volunteers are also encouraged to share before and after pictures on social media to increase awareness and visibility on their positive contribution. Sidewalk status information can also be shared with other applications to give pedestrians a real-time sidewalk status description, inform them about slipping hazards, and even suggesting alternative pedestrian routes based on sidewalk status. To measure the success of the application, it is suggested to start with a pilot program on the busiest pedestrian streets in Hamilton, such as King Street East.

Next Steps

For our next steps we would need to establish the technology required to run the mobile application including frontend and backend coding and release the beta application on the Appstore. Furthermore, we would need to conduct additional interviews with users for their opinions. Depending on users' ratings and reviews, respond to their feedback by adding map features, and update the application. Moreover, we would need to incorporate more accessibility features on to the application such as weather conditions. Our last step would need to integrate social media applications and be able to monitor safety issues through threads and hashtags.

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