

# **Evaluating the Impact of Upcycled Technology on Post-Secondary Students: Improving Equitable Access**

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**Abstract:**

Undergraduate students may encounter various challenges impacting their mental well-being, including academic pressure and financial stress. A cost-effective solution to help students remain technologically current without excessive financial strain is the refurbishment of information technology. Refurbished technology offers a practical alternative to purchasing brand-new devices, providing functional, nearly new products at reduced prices after thorough inspection and repair. This solution not only addresses the gap in technological access but also relieves financial pressures and supports academic success. Our study aims to explore the value of free technology for post-secondary students. Through analysis of 20 qualitative undergraduate student interviews, we seek to offer practical recommendations to enhance the ACCESS Tech Program at McMaster University, thereby increasing its positive impact on students' lives. Additional anticipated outcomes include inspiring the development of similar initiatives in both public and private educational institutions.

**Keywords:** Qualitative Thematic Analysis, Upcycled Technology, Technology Reuse, Sustainability, Student Experience, McMaster University

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## **1.0 Introduction**

### ***1.1 Stress factors for students***

Many undergraduate students face a plethora of hardships throughout their education. This can contribute to poor mental health and well-being. Students experience academic pressure due to intense academic workloads, excessive periods of studying, and time management etc. Research points to worse academic stress being correlated with poor mental wellbeing (Barbayannis et al., 2022). Students also have many different costs, such as tuition, educational materials, housing, food, etc. This financial stress can further impact their academic performance (Moore et al., 2021), subsequently contributing to more academic stress.

### ***1.2 Benefits of refurbished technology for students***

Rapid technological advancements have made it increasingly difficult for post-secondary students to cope with the demands these changes bring in educational and professional settings. The continuous development and release of new technologies push consumers to purchase more up-to-date equipment, due to reduced product life cycles and the need to keep up with advancements (Kumar et al., 2017). A common solution that students utilize to overcome the challenges posed by these changes is to obtain used, second-hand technology.

Electronic technology refers to second-hand electronic devices or equipment that are inspected and repaired to restore it to a functional and nearly new condition. It is then sold at a reduced price to consumers. Purchasing refurbished technology is situationally preferred in today's society as the price and pace of new technology continues to increase (Esmaeilian et al., 2021). In comparison to purchasing second-hand technology that has not undergone the refurbishment process, refurbished technology can be favoured among consumers as it can provide them with a level of reassurance regarding the quality and lifetime of the technology they are purchasing. Nonetheless, many people choose to obtain second-hand technology that has not undergone refurbishment through thrift stores, online platforms, and donations. Purchasing this type of second-hand technology has its drawbacks because it can be difficult to determine the quality and condition of the equipment if the consumer lacks the expertise to do so.

### ***1.3 Environmental benefits of refurbished technology***

The use of second-hand electronics has been shown to have many benefits related to sustainability, specifically environmental sustainability. By choosing to use second-hand devices, consumers are actively contributing to the reduction of electronic waste by diverting these items from landfills (Fatimah & Biswas, 2016). It also minimizes the environmental impact associated with the disposal of electronic components. This includes the reduction of various hazardous materials used in electronic devices, most of which are heavy metals, being disposed of and polluting the environment (Curvelo Santana et al., 2021). Additionally, since refurbishment only replaces the parts of a device that require replacement, rather than the entire device, it has the potential to contribute to resource conservation and reduce the degradation of natural resources (Fatimah & Biswas, 2016). Specifically, it reduces the amount of production taking place, a

process that is highly resource and energy-intensive, thereby lessening the demand for raw materials and minimizing environmental impacts associated with extraction and manufacturing processes. Given that the technology sector stands as one of the world's largest and most rapidly expanding sectors of manufacturing and waste, increased usage of refurbished technology has the potential to reduce the role that this sector plays in climate change (Menikpura et al., 2014; Tanskanen, 2013).

#### ***1.4 Economic benefits of refurbished technology***

The economic benefits of recycling electronic devices and the use of second-hand technology are evident. Recycling electronic devices can be a profitable process as it allows for the reuse of valuable materials, such as various types of metals, found in e-waste (Tanskanen, 2013). This process also acts to reduce the need for, and costs associated with, raw material extraction and manufacturing (Tanskanen, 2013). The refurbishment process also possesses many economic benefits. The costs associated with the refurbishment process of information technology can be notably less than the costs associated with the manufacturing of new products from scratch. For instance, the refurbishment process has been shown to require less energy and raw materials compared to the manufacturing process (Sharma et al., 2016). Thus, refurbishing products can allow a company to remain profitable (Guide & Vanwassenhove, 2001), especially considering that there is an evident demand for budget-friendly and eco-friendly information technology alternatives (Atasu et al., 2008). Another way that refurbishment can benefit the economy as it contributes to moving away from a linear economy and towards a circular economy (Seyring et al., 2015). Specifically, a linear economy is one in which a product is consumed and then eventually disposed of, whereas a circular economy is one where there is ideally no waste and existing products and materials are kept in use for as long as possible through various processes (Neves & Marques, 2022). Moving towards a circular economy would contribute to long-term economic stability as it follows a “no-waste” approach, meaning it would act to reduce waste, the need for resource extraction, and issues regarding the scarcity of natural resources. Additionally, extending product lifecycles through refurbishment would benefit the economy as consumers would be able to save money when purchasing electronic devices. Being able to save money by purchasing technology at a reduced price and not having to invest in frequent replacements, consumers would be able to spend their money on other goods and services. This would essentially stimulate economic activity across different sectors, rather than one, fostering overall economic growth. Lastly, the refurbishment of electronics provides increased opportunities for employment in sectors that focus on reuse and recycling (Williams et al., 2008).

Despite the economic benefits associated with refurbishment, businesses are hesitant to implement such structures as they generally involve large investments, tedious processes, and efficiency related challenges (Zhang et al., 2021). The amount of e-waste being generated globally has increased significantly over the years yet only a small fraction of it is recycled, negatively impacting the efficiency of refurbishment (Tanskanen, 2013). Additionally, the material composition of e-waste drastically varies based on the type of product being recycled, further complicating refurbishment processes (Tanskanen, 2013). Lastly, there are many costs associated with the refurbishment processes, including the collection and transportation of e-waste, sorting of e-waste, pre-assessment of equipment, and repairing the equipment

(Tanskanen, 2013). Such factors may deter businesses from integrating a refurbishment system into their operations, due to it not being perceived as worthwhile.

### ***1.5 Social benefits of refurbished technology***

The refurbishment and reuse of information technology offers social benefits that are intricately linked with the economic and environmental benefits they yield. One of the more significant social benefits that these processes produce is increased accessibility of technologies. As refurbished and second-hand products are offered at a reduced price compared to newly manufactured products, they are more affordable and thus accessible. This can be beneficial for many communities, such as low-income individuals and individuals belonging to marginalized groups. Such increased accessibility improves social inclusion as it allows more individuals to be able to participate to a greater extent within society, acting as a social and economic benefit (Kissling et al., 2012). For example, it increases educational opportunities and job prospects for those that may not have been able to afford brand new technology such as post-secondary students. The environmental benefits of refurbishment also bring rise to social benefits. As the impact that the technology sector has on the environment decreases, such as its contribution to landfills and its energy and resource intensive nature, we can observe improved environmental conditions and healthier living environments globally (González et al., 2017). This can improve the overall health and quality of life of many.

### ***1.6 The ACCESS Tech Program***

ACCESS Tech is a program at McMaster University that collects used technology, such as laptops, mobile devices, keyboards, and monitors, and refurbishes them. This technology is then made available to Hamiltonians in need, as well as to McMaster students (McMaster University - Facility Services, 2024). This program is a joint initiative between students from the Academic Sustainability Program, University Technology Services (UTS), McMaster's Facility Services, Empowerment Squared, and network agencies (McMaster University - Facility Services, 2024). The ACCESS Tech program is driven by the social, economic, and environmental impact it has had since its establishment. It aims to reduce the environmental burden associated with the production and waste of technology and electronic devices by refurbishing and distributing donated technology. The program's social impact is driven by its mission to enhance technology accessibility, achieved through the distribution of free refurbished electronic devices. This initiative serves to bridge the digital gap and foster inclusivity. The economic impacts of the program are related to the social impacts as they stem from the programs ability to broaden access to technology and foster increased societal participation, in turn benefiting our economy.

All in all, the program recognizes that finances are a barrier for those in need of technology yet is also a requirement. Technology plays an indispensable role in the education of countless students, shaping not only their academic journey but also their ability to participate in society. By offering technology in such a way, programs such as ACCESS Tech have the potential to reduce student stress and enhance academic performance.

## ***1.7 Brief Overview of the Study Context***

For this study, we aimed to identify and understand the current and potential value of receiving and reusing second-hand technology for post-secondary students. This was done by interviewing post-secondary students attending a technology upcycling event. Each interview was analyzed to gain insight on their perceptions of the value of free second-hand technology.

The study will use our findings to provide recommendations/suggestions to improve the ACCESS Tech Program to enhance the beneficial role it plays in post-secondary students' lives. Additionally, we aim to clearly communicate the role that receiving and reusing second-hand technology can have in students' lives. By doing so, we hope to motivate the implementation of similar programs and initiatives at other public institutions.

In this paper, we will outline a methods section that delves into recruitment strategies, informed consent procedures, and data collection analysis methods. We consider various aspects of thematic analysis, including what constitutes a theme, the distinction between rich description and detailed accounts, and the choice between inductive or theoretical approaches. We also discuss epistemological considerations. Followed by the results section that highlights the benefits of upcycling technology for students, including improved academic performance, skill acquisition, quality of technology, time-saving benefits, and alleviation of financial pressure through better budgeting and management. The discussion expands on these findings, considering implications for upcycling events and the circular economy, and outlines potential next steps. Finally, we express gratitude in the acknowledgments section.

## **2.0 Methods**

The goal of this qualitative research study was to better understand the value of upcycling second hand technology for post-secondary students. This study has received ethics approval from McMaster's Research Ethics Board (MREB #6001).

### ***2.1 Recruitment***

The ACCESS Tech Reuse / Upcycle event was promoted online via social media platforms, such as Instagram. We recruited study participants on-site at the collection event that took place on October 27th, 2023, between 10:00 a.m. - 2:00 p.m. on the McMaster University Burke Science Building ("BSB") Field. Attendees were provided 5 minutes to view and select their items, to a maximum of what they could reasonably carry. They were able to return items to ACCESS Tech if they changed their mind or decided against their choice. Our team of researchers was on-site to connect with and gather feedback from attendees who had just experienced the event, providing us with valuable insights and viewpoints. To carry out this study, we partnered with both ACCESS Tech and students from McMaster's esteemed SUSTAIN program, including 3S03. Their efforts in organizing and executing the event were integral to its success. After participants had selected their preferred technology, we approached them to introduce the research project. We also offered a \$10 Starbucks gift card as an incentive before

confirming their participation.

After, we briefed all participants on study protocols, such as how the interview is organized, all in accordance with the Letter of Information of the study. This form of recruitment was practical, time-efficient, and economically friendly. As this research involved seeking the motivations of upcycling second-hand technology, recruiting on-site was a practical and efficient way to reach as many donors as possible without requiring participants to visit an alternate location for the interviews. Each of the five student researchers conducted interviews with donors they recruited using the provided guide.

## ***2.2 Informed Consent***

To make sure that participants in our study were giving informed consent, we asked them a series of questions and provided them with an Oral Consent Script outlining the study protocols. We explained the study's purpose and asked for their permission to participate, as well as their consent for the anonymous use of direct quotes and audio recording. We also informed participants of the potential risks involved in the study and provided them with information about the study's processes, including transcription and timeline. We emphasized that participants were free to skip any interview questions they did not wish to answer or end the interview at any point, all while still receiving the incentive for participating.

## ***2.3 Data Collection***

Data was collected through interviews with donors at the 2023 ACCESS Tech October event. With the approved consent of our participants, we recorded interviews to be transcribed at a later date, ensuring participant identity confidentiality throughout all stages. We also informed participants that they may choose for us to provide hand-written transcription instead of being audio-recorded. However, no participants requested notes be taken by hand, meaning all interviews were recorded with handheld recorders. Data collection took place on the McMaster University campus on October 27th, 2023, between 10:00 a.m. - 2:00 p.m. We asked all participants questions regarding their experience at the ACCESS Tech upcycling event, their motivations for attending the event, what they were going to use their tech for, and the pressures and stresses this technology would help alleviate. After conducting interviews, we collected the audio files and transferred them to a secure drive hosted by McMaster's Office 365 SharePoint. We then deleted the audio files from the original recorders to ensure that we are complying with participant privacy standards as outlined in our ethics documents. For each interview, we transcribed the audio, made revisions to ensure accuracy and provide context to the conversational tone, and then coded the data. Finally, we identified themes throughout the data.

## ***2.4 Data Analysis***

Data from this research project was analyzed using thematic analysis. Thematic analysis seeks to identify patterns, called themes, within a variety of forms of data, in this case, interviews. Though this is a process that is regularly utilized for qualitative research, it is often poorly described and outlined in the literature. Despite this caveat, Braun and Clarke (2006) aimed to provide a detailed explanation of this form of data analysis which was heavily referenced for the

purposes of this research. Thematic analysis required several decisions be made prior to analysis, in accordance with Braun and Clarke (2006). These decisions are outlined below. We ensured the accuracy of the transcripts by cross-referencing them with the original audio recordings. Firstly, we read all the transcripts multiple times to find new ideas until we exhausted all possibilities. Secondly, we collated relevant ideas into codes based on the initial ideas. We discussed our findings, deliberated on new codes, and revised the data accordingly. Thirdly, we gathered all relevant data and came up with individual themes. We then reviewed the themes together, cross-referencing the coded extracts and the entire data set to ensure relevance. Finally, we refined the themes by defining and naming them. In case of disagreement, we held a comprehensive discussion with the entire group while referencing the data until we reached an agreement. Lastly, as a team, we selected key extracts to include in the final manuscript.

A theme can be identified by its prevalence within the data. This prevalence can be determined by the observation of a patterned response within the data (Braun & Clarke, 2006). A theme was determined prominent if it appeared in half or more of the interviews. Topics or possible themes were identified as significant themes if they were observed in more than six interviews. We conducted a comprehensive analysis and organized these codes and discoveries into three key areas: the free technology's impact on academic and extracurricular endeavours, time allocation, and its potential to reduce financial stress.

We decided to pursue a rich description of the data set. We selected this method to provide a more comprehensive understanding of each theme that is missing in the existing literature. At present, the literature on the topic is not comprehensive, and when considering the local context of McMaster University, previous groups have not discussed the importance of acquiring and repurposing upcycled second-hand technology for post-secondary students.

Providing a broader scope, rather than a narrow one in accordance with the detailed account approach, may allow for future research to further explore related phenomena. Choosing to proceed with a rich description may lead to a loss of nuance, detail, and understanding of specific themes. It would be beneficial to provide a detailed account in the future when there is more literature available.

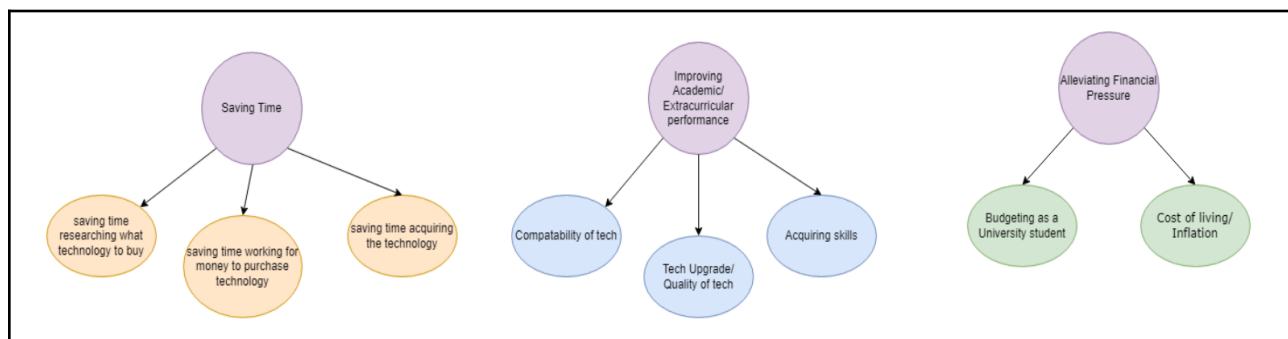
For this research, we conducted a top-down thematic analysis, with a theoretical approach. This is analysis-driven. Themes are identified based on pre-determined constructs, analysis and knowledge. We did reference a previous project group's report that conducted research on a similar event held the prior year (Laurie et al., 2023). A new group of students conducted this project, and they didn't incorporate much of the previous research in this subject area into their work. The motivation to analyze the collected data in an unbiased manner further strengthened the decision to take an inductive approach.

For this project, semantic themes in our data were analyzed. This approach is more accessible and transparent, making it easier for us as researchers, and our readers, to understand and relate to the findings. Selecting semantic themes is a suitable method for us because we aim to have a clear, comprehensible, and effective way to recognize and explain the reasons behind upcycling technology and its real and perceived value associated with such. This approach is especially

useful as our research objectives and situation correspond with a more superficial analysis of the information. We will use an essentialist approach to thematic analysis. Using this approach, we can theorize the motivations, experiences, meanings, and reality of the participants due to the unidirectional relationship between meaning, experience, and language. Our group is researching the experiences of using pre-owned IT and the perceived and real value of such. To theorize our data, we will primarily be using the essentialist approach, which focuses on understanding the underlying essence or nature of a phenomenon. In contrast, the constructionist approach examines the ways in which events, realities, meanings, and experiences are influenced by different discourses operating within society. However, since we are seeking to understand motivation within individuals, which is not the main focus of the constructionist framework, using this approach is not ideal for our research.

### 3.0 Results

Our research aimed to understand the potential value of receiving free upcycled technology at McMaster's ACCESS Tech Student Reuse Event for post-secondary students. Through the analysis of 20 in-person interviews, we identified prevalent themes and codes that characterized the value of the technology these students were receiving. We coded the transcripts to identify reoccurring themes and conducted a thematic analysis where 3 themes were identified: saving time, improving academic/extracurricular performance, and alleviating financial pressure. These categories were formed after multiple (3) rounds of coding, where the most prevalent codes were identified and grouped. In addition to these 3 themes, 8 sub-themes emerged with further analysis: saving time researching what technology to buy, saving time working for money to buy technology, saving time acquiring technology, compatibility of technology, technology upgrade/quality of tech, acquiring skills, budgeting as a university student, and cost of living. The thematic map depicting this is shown in Figure 1 below. Previous iterations of this map are shown in Appendix A.



**Figure 1. Final Thematic Map of the role of upcycled technology\**

#### 3.1 Saving Time

We found that one of the main contributors to improving both academic and extracurricular performance was saving time. After reviewing the transcripts, saving time, in any of these 3 manners, was mentioned in all 20 interviews and served as our most prominent theme. Participants describe how access to quality technology saves time in three ways – saving time researching what technology to buy, saving time working for money to purchase technology, and

saving time acquiring the technology.

### ***3.2 Saving time not needing to research***

When describing how access to free upcycled technology saved participants time researching what technology to buy. This was mentioned by 14 out of 20 participants. Participants noted that if they were investing money to acquire a piece of technology, they would need to conduct adequate research on the different options available, in order to ensure the specifications met their specific needs.

When asked how long they would spend looking for the same tech item they received for free, participant #3 said:

*“I usually take my sweet time doing this because I need to find the right price and the right specifications for my particular usage. So anywhere from 2 weeks to 4 weeks I would say”*

Similarly, participant #13 noted:

*“Yeah, most of my time goes into research like comparing the specs and stuff like that. So in scenarios like this, there isn't much, like a lot of things to look around, so it takes a few minutes to find the best out of the worst and if you are online, it is probably harder because you have 15-20 tabs open and you have to switch between the tabs to find the best item for the price and everything so it is a bit challenging but it is not impossible”*

This demonstrates that each participant has varying levels of time needed to research before committing to purchasing technology. This time spent can be completely avoided by having access to free technology.

### ***3.3 Saving time not needing to work to make money***

Saving time working for money to purchase technology was also coded for and appeared throughout the interviews. Participants articulated how access to free technology significantly reduces the time that would otherwise be dedicated to working and earning the funds necessary to purchase these devices. This was mentioned by 10 out of 20 participants.

Many participants noted the myriad responsibilities that accompany university life, ranging from demanding coursework to extracurricular activities and part-time employment. During the interviews, participants often quantified the monetary value associated with acquiring technology, providing insights into how much time would be spent saving up this money.

Participant #7 said:

*“If I were buying it new, I mean this is probably an older model but a model today we are probably talking around 150 bucks for it. And if it were used I would probably pay around 70 bucks, 50 bucks probably?”*

By translating these monetary values into time equivalents based on their typical earnings,

participants highlighted the substantial time commitment required to accumulate this money.

### **3.4 Saving time acquiring tech**

The final code under the theme of time was saving time acquiring the tech items. Participants mentioned that commuting or travelling to purchase or pick up their tech items was a time consuming process. This was mentioned by 11 out of 20 participants. They expressed the convenience of obtaining these devices without the need to venture off-campus, thus saving valuable time that would otherwise be spent commuting or navigating transportation challenges.

When asked what challenges they face with acquiring technology, participant #13 remarked: *“For me, the main issue would be like going to the different stores, like we’ll have to take buses. Walmart is all the way on the mountain. So like we have to take two buses, then Ancaster, the bus ride is very long. So the main thing would be like transport”*

Evidently, this highlights the extensive time students spend transporting to acquire technology, which is avoided by upcycling events on campus property.

### **3.5 Improving Performance as a Post-Secondary Student**

A recurring motive amongst interviewees describing the value of the technology they received was fulfilling the desire to enhance their performance as post-secondary students. This theme was formed as participants expressed what they intended to do with the free technology items and why they chose that specific item. We found that the intended use and desire of the technology fell within three sub-themes associated with improved student performance: acquiring skills, quality of technology and technology upgrade. Participants expressed the value of being able to choose any tech item they desired from the available options and our categorization aimed to understand why certain students were drawn towards certain items.

### **3.6 Acquiring Skills**

As transcripts were coded, it was revealed that acquiring skills was a prominent motivator for why students chose to take a refurbished piece of technology. Some might think it burdensome to receive a tech item without knowing what to do with it, 18 out of 20 participants expressed a desire to use their new tech items to develop related skills in either their academics, extracurriculars, or personal hobbies. Participants noted that their academic programs require specific software and applications to complete coursework, and that it is difficult to perform well academically without the proper tools to support their studies.

When asked what the intended use of their refurbished laptop, participant #17 said: *“Right now I am a grad student. I have to do a lot of projects. Especially for my subjects, VI and ML”*

Others however described how the technology would allow them to acquire skills not only for academic-related purposes, but also for their own personal enjoyment and hobbies.

When asked about what sorts of tech devices they would like more of at these events,

participant #11 shared: *“Maybe more small stuff like mice or keyboards and stuff like maybe chargers or like a PS4 controller, or at the least maybe hard drives or stuff like printers, maybe even old phones. We can open them up and learn the hardware components for our research purpose and stuff like that yeah”*

Additionally, participant #16 stated:

*“I think technology plays a vital role in every action that I do because I use technology for my personal tasks, for keeping track of emails from the university. It’s a platform for me to do my assignments for me to make sure that the work gets done for my courses and it is also very important for me to have because it’s a tool I have for communicating and personal growth as well. If I do any personal courses online, I need a platform to practice that on”*

This demonstrates that although each participant has their own unique desires for the use of their tech item, the main goal is to acquire skills and having access to free refurbished technology facilitated that desire.

### **3.7 Quality of Technology**

Quality technology transcends mere performance metrics, encompassing reliability, durability, and efficiency. The participants mentioned how they sought tech devices that reliably supported their academic pursuits. Their perception of quality considered devices capable of enduring daily use, regular wear-and-tear and those that facilitated productivity. 12 out of 20 participants mentioned quality.

Participant #3 mentioned:

*“I really needed a monitor because I usually work with one. I have a co-op going on right now and it’s really important for me to have a second monitor in addition to the laptop I have from the company so that I can multitask and can get my action items done quicker, and then get free er quicker and probably work on my own things then. This monitor was very high quality on the market and in good condition too”*

This demonstrates how the student chose this tech item due to its good-quality condition and reliability. They felt it would be useful in improving their performance academically and in their career-related projects.

### **3.8 Technology Upgrade**

The final sub-theme under the theme of Improving Performance as a Post-Secondary Student was the opportunity for attendees to upgrade their technology for reasons that suited their personal needs. 10 of the 20 participants mentioned their perceived value of the free tech items was rooted in upgrading their currently owned technology or receiving something that was more compatible or missing from a system they already owned. Although this was not our most prevalent theme, it provided great insight into the different ways participants defined value of upcycled technology. Participants noted that the refurbished tech item they received at the ACCESS Tech event was either newer or in better condition than an item they already owned. Participant #4 said:

*“I think I found a better monitor. I already have one, but I think this one is better for my other workspace and a wireless keyboard which is nice and will make my work a lot easier”*

This shows that although this individual already owned a similar monitor, they perceived this monitor as an improved version.

Furthermore, Participant #7 shared:

*“I wanted a CPU to install the software because in Mac laptops it's very difficult to install software because it takes a lot of space and then again you need to install a boot camp. That's too much, like you need to use some other VPN access to install the software and then create a wall. It's difficult. For Windows, it's easy for you to do it”*

This shows that participants aimed to upgrade their technology to devices that were more compatible with the capacity and functionality needs of their academic work, subsequently impacting their performance.

### **3.9 Alleviating Financial Pressure/Financial Planning and Management**

Within the "Alleviating Financial Pressure" financial planning and management section, we had two subthemes: budgeting as a university student and cost of living/inflation. Budgeting as a university student involves managing expenses like tuition, textbook fees and supplementary fees associated with course work. Several participants shared the need to purchase new software and hardware, such as AutoCAD, to complete university assignments. In contrast, cost of living/inflation considers broader economic factors like rising grocery prices, highlighting external influences on students' financial stability. Participants expressed the difficulties balancing these expenses with university related ones.

The analysis of interview transcripts revealed a prominent theme regarding the financial advantages of accessing second-hand technology among post-secondary students. Many participants highlighted that having the opportunity to receive free technology could alleviate the financial strain that they experience as students. By receiving it for free, they no longer had to budget for it along with the other expenses they are responsible for as students. Of the 20 participants interviewed, 16 participants expressed that it is difficult to budget for technology when they have other expenses such as tuition, textbooks, and rent.

In an interview, when asked about their experiencing acquiring tech as a student, participant #9 expressed:

*“it's not as easy when you are paying for tuition and you have other costs and most of the time, students are only working part time because they have school so it's hard to be able to afford a lot of technology”.*

This highlights the difficulty of acquiring tech from a financial standpoint. Budgeting for tech items, alongside other university-related expenses, is difficult for students.

### **3.91 Cost of Living**

Furthermore, participants consistently highlighted the challenges posed by other expenses, unrelated to university. Students expressed difficulty affording technology equipment, as they have to prioritize between meeting basic needs and investing in educational tools. This was expressed by 12 out of 20 participants. Some explicitly stated how this is exacerbated due to the increasingly high cost of living, influencing their purchasing decisions.

Evidently, students take into consideration the cost of living and price of the technology when it comes to acquiring technology. In an interview, when asked about the challenges they face when acquiring technology items, participant #8 shared:

*“with the status of inflation and the scarcity of jobs, I would say price is the number one priority or concern I have”*

In summary, the results show that McMaster's ACCESS Tech Student Reuse Event significantly impacts post-secondary students' time management, academic performance, and financial stability. Saving time emerges as a key theme, with students expressing reduced research, less work for tech funds, and convenient access to technology. Participants also share a desire to improve their academic performance through acquiring skills and utilizing higher quality and upgraded technology. The event also alleviates financial pressure by providing budget relief and addressing the rising cost of living. These findings highlight the tangible benefits of upcycling events for students, offering valuable insights for both institutions and students facing financial constraints.

## **4.0 Discussion**

### **4.1 Role of ACCESSTech in Improving Student Wellness**

By providing students with free technology, ACCESSTech is playing an integral role in improving student health and wellbeing. By acquiring upcycled technology on campus through the ACCESSTech upcycling event, students expressed how they were able to save a considerable amount of time. They saved time in a wide variety of different respects, including time saved not researching what technology to purchase, time saved not having to work to acquire funds to purchase the technology and time saved not having to commute to other physical locations, like nearby retail store such as Walmart, to purchase the technology. This conserved time could be spent towards completing school-work, allowing students to be less stressed about upcoming deadlines. Furthermore, this time could also be spent engaging in extracurricular activities, personal hobbies, and further engaging with and developing relationships with peers. This can help to reduce stress, academic burnout and mental health concerns, which is a significant concern amongst undergraduate students. Spending time with peers, through personal activities or extracurricular events can help students build strong social supports, reduce feelings of isolation and cope with stress (Friedlander et al., 2007). Similarly, engaging in personal interests can help students recharge and unwind, and take a break from academic pressures (Masten, 2009). Additionally, the rising cost of inflation is felt by students, experiencing higher rents,

greater grocery costs, etc (Beiter et al., 2015). By alleviating some of the financial pressure associated with purchasing technology for school-related purposes, students are able to allocate their limited budgets towards other expenses, both university (e.g. tuition, supplementary course fees) and non-university related (e.g. rent, utility and grocery bills). This can help to alleviate some of the financial pressure faced by undergraduate students, which has shown to be a significant contributor to stress and poor mental health (Hossain et al., 2023). Ultimately, this highlights how access to free technology not only fulfills basic technology requirements for academic purposes, but has a profound underlying impact on student mental health and wellbeing.

#### ***4.2 Improved Investment in Tech-Related Initiatives***

Today, technology has proven itself to be an indispensable resource in every academic field. It has evolved to be a tool, but also a means of education in itself. It aids in communication, accessing information, sharing ideas and coming up with new ones. At an institution like McMaster University, leveraging technology to foster a community of learners and problem solvers is of utmost importance. McMaster University prides itself on its world-class teaching and research and the basis of such reputation can be partially credited to the tech-advanced culture of being a student at McMaster. It is close to impossible to be a student without a minimum of a few hundred dollars in technology whether that is in the form of computers, laptops, phones or tablets. In addition, success can often feel dependent on the quality of the technology you own, there is always a new device or feature that can enhance your education.

Unfortunately, as this study highlights, there remains a gap, where students do not have the appropriate means of acquiring this technology, despite demands to excel in this tech-driven academic space. The responsibility of purchasing expensive technology is on students. As this paper highlights, these students already face significant financial burden from student loans, supplementary course material fees, rent, food and basic living necessities. This is exacerbated by the rising cost of inflation. If students at McMaster University are already performing within the top 200 of all other global universities, it poses the question- if students were relieved of the burden of purchasing their own technology, how much more would their performance excel as students, given that they could direct their time, money and energy towards improving as a student and learner?

This can be effectively addressed through greater investment in tech-related initiatives at McMaster. Having more frequent ACCESSTech upcycling events would allow more opportunities for students to acquire this technology. All 20 participants expressed their desire for more events. Hosting events on different days can potentially result in more student turn-up, as certain days may align better with some students schedules compared to others. Furthermore, physical location plays a crucial role. Most buildings on campus are associated with certain faculties. For instance, John Hopkins Engineering Building, Burke Science Building, and Psychology Building are associated with engineering, science and psychology lectures and tutorials respectively. Hence, hosting these events at different locations across campus each time can help to engage students from various different disciplines, and ensure all students,

irrespective of discipline of study, have an equal chance of acquiring this technology.

Aside from ACCESSTech events, the university can improve student accessibility to technology through various other means as well. For instance, improvements to the pre-existing library technology loan program. Currently, students can use desktops located at the libraries on campus. However, completing course work within the library may not always be feasible. Students may be require a private space to complete course-work for examinations, and based on their own learning needs. Investment into laptops that can be loaned out to students would greatly help address this issue. This has already been implemented in secondary students in Canada, where students can sign-out netbooks for academic use, and has shown great success in addressing tech related accessibility issues within high schools. Applying this within the context of post secondary education would be greatly beneficial for post-secondary students as well. Furthermore, McMaster currently provides a wide array of financial bursaries that students can apply to for financial assistance, like those associated with living expenses or school related travel. Developing bursaries specifically for financial hardships acquiring technology would be greatly beneficial for students.

#### ***4.3 Opportunity for Collaboration***

Ultimately, tech-related accessibility issues for post-secondary students are a global issue, and not just McMaster University specific. Currently, it appears McMaster is the only university within Canada to develop an upcycling tech related initiative. It is a great leader in this field and can collaborating with other Ontario universities in Canada, to help them develop, establish and executive initiatives similar to ACCESSTech at their own universities. This can help us have a greater impact, through ensuring more post-secondary students acquire upcycled technology. The essence of community lies in fostering collaboration, mutual support, and a conducive environment for learning. Inter-faculty collaboration can also play an integral role. Faculties, such as engineering, can organize refurbishment workshops and providing hands-on learning opportunities. Engaging students in the process of refurbishing technology not only equips them with valuable technical skills but also promotes sustainability and responsible consumption. This aligns with contemporary pedagogical approaches emphasizing the importance of experiential learning and practical skill acquisition (Kolb, 1984). The benefits of fostering a community of learners through upcycled technology events extend beyond the academic realm. Research suggests that students who feel connected to their peers and institution are more likely to persist in their studies, achieve higher grades, and develop a sense of identity and purpose (Tinto, 1993). By creating opportunities for students to collaborate, share knowledge, and support one another, universities can enhance the overall student experience and contribute to student success and well-being. Moreover, fostering a culture of students and staff who are motivated by improving their relationship with technology will not only enhance academic outcomes but also cultivate a more innovative and adaptive learning environment. By embracing technology as a tool for collaboration, creativity, and critical thinking, individuals within the university community can harness its potential to drive positive change and address complex societal challenges. By instilling a mindset of lifelong learning and technological fluency, students and staff will be better prepared to navigate the demands of an increasingly digital world, ultimately contributing to their personal and professional success.

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# Appendices

## Appendix A

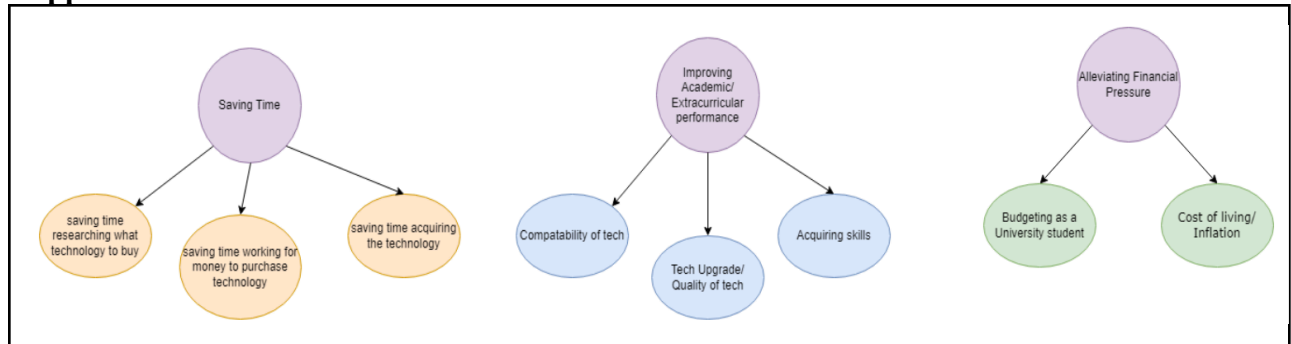


Figure 1. Final Thematic Map

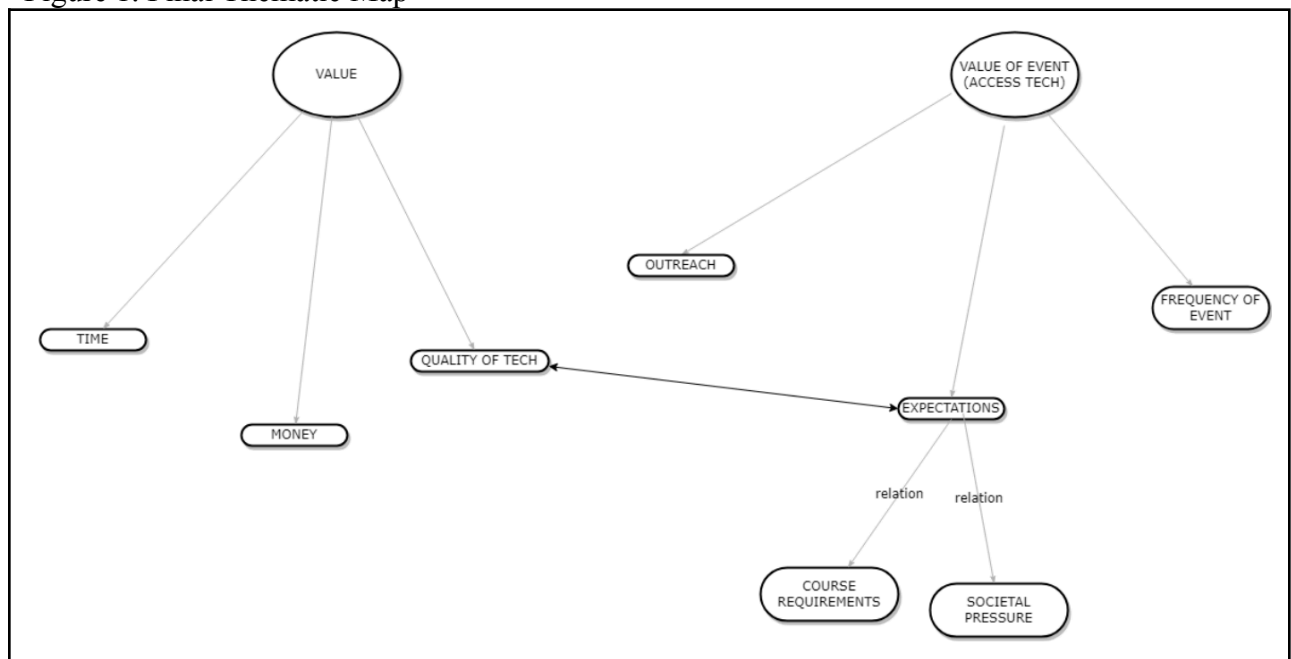


Figure 2. First Draft of Thematic Map

