Playmaker's Practicum

Concept Loop: Brief #1

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Contents

1 Client Profile

1.1 Problem Statement

Pakistan faces a pressing need for increased construction to spur development and recover from recurring floods. However, the availability of sustainable and affordable construction materials remains limited. Pavers constitute a significant portion of the construction industry in Pakistan, and ensuring a consistent supply is essential. Concept Loop's innovative product offers a cost-effective and eco-friendly alternative to traditional cement pavers. It utilizes a widely recognized, challenging-to-recycle material(multilayer plastic packaging) and actively mitigates carbon emissions associated with the construction sector.

1.1.1 What context do they operate in?

In Pakistan, the annual production of plastic waste exceeds 3.3 million tons, with only a fraction being effectively recycled. The more challenging-to-recycle plastics, like multilayer packaging, often find their way into the oceans, posing a significant threat to marine ecosystems. Concept loop is dedicated to diverting this plastic waste from entering our oceans by upcycling it into a durable and eco-friendly product. Notably, each Loop-Paver (key product) can offset 4 kg of carbon emissions, reducing the reliance on cement production—a sector responsible for 8% of the world's annual carbon emissions. As a substitute for traditional cement pavers, their product emerges as a climate-conscious solution, addressing the growing construction demands in Pakistan while championing environmental responsibility. The primary source of plastic waste for Loop-Pavers comes from kabariwallas, who constitute an essential but often overlooked segment of the global waste workforce. Recognizing their invaluable contribution, their organization partners with initiatives that empower kabariwallas by providing dignified employment opportunities, ensuring safe working conditions, and fostering their social inclusion.

Furthermore, they are committed to achieving a "circular economy" in plastic, which is a concept that is little known in Pakistan. It involves making complete use and reuse of existing materials and keeping the services in circulation, in order to reduce waste and increase the life cycle of products.

1.1.2 What are they contributing to their field?

Found in 2021, Concept Loop aims to redirect plastic waste from oceans and landfills into building materials and lifestyle products. In the process, they offset harmful carbon emissions that would result from energy generation through the use of plastic. The company focuses on recovering waste plastic and processing it into bricks, partition boards, decorative sheets, and value-added furniture items.

1.1.3 What is the key value proposition of their products & services?

- Concrete products: Pavers, Blocks and Tiles
- Lumber products: Furniture, Partition Boards
- Other Lifestyle Products: jewllery, coasters, eyewear.

Loop-Pavers have been tested to meet the industry requirements for pavers for strength, compression, and durability Cement and concrete dominate the construction material market, and are also responsible for 8% of the global carbon emissions. By providing a sustainable alternative with superior quality at low cost, they offer a solution to modify consumption. Their lumber products exhibit exceptional resistance to water and termites, significantly prolonging their lifespan. Furthermore, these products remain unaffected by humidity, making them an ideal choice.

1.1.4 What is the unique selling point?

Social Impact: Concept Loop is playing a significant role in the lives of its customers and the community at large. Through their work, they are not just responsibly making use of single-use plastic to create products, but are also in turn educating people about the impact our carbon footprint has on the environment. Moreover, Concept Loop has also successfully collaborated with locals to recycle plastic, which has created job opportunities and contributed to the local economy. Importantly, the social enterprise is also actively looking for ways to increase community engagement to amplify the concern about plastic waste, empower youth to bring about a significant change and also to instigate a feeling of shared purpose and responsibility we have towards the environment.

Waste Reduction: By offering its key products and services, Concept Loop has been able to demonstrate that the concept of circular economy can indeed be practiced in Pakistan, which simultaneously benefits those involved, and also contributes towards responsible consumption. By making use of single-use plastic to create low cost, value products, Concept Loop has been success in creating environmentally conscious consumers, and has inspired people to make more sustainable choices.

Reduced carbon emission/footprint: It is known that the majority of single-use plastic ultimately reaches the ocean or landfills in Pakistan due to no recycling mechanisms readily available within the community. Due to this, the environment continues to degrade, giving rise to many problems within our ecosystem. However, all this can be significantly countered if we monitor our carbon footprint and devise ways to use utilized plastic effectively. Therefore, Concept Loop has been recycling plastic to make new products since doing that consumes less energy than producing new plastic from raw materials. This enables the enterprise to create a sustainable mechanism through which they can operate.

1.1.5 What do their customer desire?

While Concept Loop has been able to a solid impact when it comes to reducing carbon offset and plastic waste, it has also simultaneously succeeded in providing its customers with high-quality products. The first thing this enterprise owes to its customers is complete transparency when it comes to the production process. They ensure that while the products maybe high quality, they also have a negative carbon footprint and are manufactured responsibly. Their complete loyalty to their consumers is what in turn encourages them to support and advocate for sustainable practices. Furthermore, apart from complete transparency, Concept Loop has also been able to provide its customers with high-quality products, ensuring complete consumer-satisfaction. They claim that their products are aesthetically pleasing, durable and low-cost, making it an ideal purchase for the masses looking to make a positive change thats also serves them.

1.2 Target Audience

Concept Loop's target audience can be broken down into two distinct categories: Business to business(B2B) and Business to Consumer (B2C).

The United Nations Sustainable Development Goals (SDGs), are a set of 17 ambitious goals adopted by all United Nations Member States as part of the 2030 Agenda for Sustainable Development. Concept Loop is partnering with all corporates, governments, and institutions(B2B) that support UN SDGs to move towards a circular economy and are looking for solutions to their waste streams. Their key product, "Hybrid Eco Pavers" provides a durable and stable surface for vehicles or foot traffic. Also, their target audience includes architects(B2C) involved in designing construction sites such as schools, factories, industries, petrol pumps, hospitals, and even residential buildings. Their existing clients include but are not limited to Shan, Shell, Artistic Milliners, Cadbury, Candyland, SnackCity, and Bisconni. For other products such as jewelry, coasters, and eyewear their target audience is mainly the young and trendy demographic as they are the early adopters of sustainable products. Also, shoppers looking for sustainable

gifts for special occasions can opt for these products and are ready to pay a premium for environmentally friendly items. Concept Loop aims to use social media and digital marketing to reach this tech-savvy audience. Furthermore, partition boards, ornamental sheets, and repurposed furniture may appeal to interior designers, homeowners, and individuals wanting to equip their homes with distinctive and sustainable goods.

1.3 Industry - Landscape

1.3.1 Competitors

- **Green Earth Recyling** Founded in 1992, Green Earth Recycling aims to find sustainable solutions for packaging and factory wastes of major corporations and government organisations. They specialize in value-added furniture items.[1]
- **Replaste** Founded in 2020, Replaste mainly focuses on Sapor: decorative sheet while offering great quality and customizations.[2]
- **The Green Ark** Founded in 2022, TGA aims to provide recycling solutions for post-industrial waste and post-consumer waste. They are not a direct competitor as they upcycle plastic into resuable form. [3]
- **Bigger Brick** Founded in 2021, Bigger Brick specializes in manufacturing construction-grade building material in the form of Lego-like bricks that are easy to assemble. [4]

1.3.2 Comparison

(refer to Table 1 on the next page)

1.3.3 What makes your client unique?

- Making value-added interior design products such as Rplastic Decorative Sheets for Indoor & Outdoor use
- For the masses, targeting the interior design market (Partition Boards)
- Relatively low-cost, minimal eco-markup

1.3.4 Competitive Advantage

- Product Diversification: Concept Loop manufactures multiple products that essentially belong to two separate categories: Concrete products and Lumber products. While concrete products include pavers, blocks, and tiles, lumber products include furniture and partition boards. Additionally, they are in the process of exploring lifestyle products like eyewear, jewelry, coasters, etc.
- Connected to a wide network of 2200 plus architects all across Pakistan.
- Due to a low cost, they are able to target the masses, which inturn leads to high volumes of orders compared to their competitors.

Name	Location	Main focus	Key products	Sustainability initiatives	Competition with Concept Loop
Green Earth Recycling	Lahore	Upcycled plastic furniture	Wooden outdoor furniture	Upcycling plastic waste into furniture	Competitor in the outdoor furniture space. They are not focused on building materials as a product like Concept Loop.
Replaste	Lahore, Abu Dhabi	Upcycled Plastic Composites	Selected Upcycled Plastic Items	Collaboration for plastic composite products	Collaboration opportunities for Concept Loop in the use of upcycled plastic composites. Targets the high-end market unlike Concept Loop
The Green Ark	Karachi	Recycled Plastic	Recycled Plastic Materials, Polymer resins	Producing recycled plastic recycled plastic furniture	Supplier of recycled plastic materials for Concept Loop's products.
Bigger Bricks	Karachi	Plastic Composite Bricks	Construction Blocks made from Plastic used in walls, sheds, fencing, offices, labs and furniture	Creating construction blocks from recycled plastic composite	Competitor in the paver/brick segment. Concept Loop and Bigger Bricks are in direct competition; however, they use high-quality plastic waste compared to Concept Loop's low-quality waste. This, in turn, alters their price points.
Concept Loop	Karachi	Various	Paver Blocks, Partition Boards, Recycled Plastic Sheets, Jewelry, Eyewear, tiles, furniture, coasters.	diverse range of products from recycled plastics	Competitor with Green Earth Pakistan in the furniture space and direct competition with Bigger Bricks in the paver/brick segment. Target the mid-low segmnet.

Table 1: Comparison with Competitors

2 Relevancy to Habib University

2.1 Project Platform: Ask from us

1. Deriving waste sorting and collection mechanism that can be used at HU and later applied to other institutions.
2. Identifying the types and sources of waste generated at the university, conducting a waste audit to measure the current waste generation and disposal practices, and identify areas for improvement.
3. Monitor and evaluate the progress and impact of this program.

2.2 What puts our team in a good position to help solve it?

Our team consists four members, of whom two are Computer Science majors, one is a Social Development and Policy major, and a Communication and Design major. The diverse team allows for different perspectives to solve the problem. CS majors hold the technical expertise to develop digital(mobile/web apps) waste collection systems for real-time monitoring of waste levels and optimization of collection routes. Social development and policy majors excel in conducting policy research on best practices in waste management and designing surveys to understand the community's behavior regarding waste generation and disposal. Also, their skills come in handy to assess the social and environmental impacts of the adopted initiatives. Additionally, communication and design skills can significantly contribute to creating intuitive and visually appealing user interfaces for digital waste collection systems, making it easy for students and staff to report issues or participate in the program. Also, communication with the stakeholders is an important component of the success of this project, which requires compelling narratives to convince the stakeholders of the uptaking of the initiatives. Therefore, our team is best suited to come up with a "feasible", "viable", and "desirable" solution. [6]

3 Problem Solving Approach

3.1 What makes it a Wicked Problem?

According to Horst W.J.Rititel and Melvin M. Webber, professors of design and urban planning at the University of California at Berkley, wicked problems are complicated, multifaceted issues that cannot be resolved with traditional processes. In a 15-year study involving 22 companies, Camillus, a professor at Katz Graduate School of Business, underlined the following five key criteria for identifying a wicked problem.[5]

1. involves many stakeholders with conflicting priorities.
2. if its roots are tangled.
3. if it changes with every attempt to address it.
4. if you've never faced it before.
5. if there's no way to evaluate whether a remedy will work.

Using the above criteria, developing a waste collection and sorting mechanism, identifying types and sources of waste, and monitoring progress and impact are considered wicked problems. Multiple stakeholders, such as students, faculty, staff, and facilities management, are involved in developing an effective waste collection and sorting mechanism. Coordinating their efforts and creating a system that addresses various waste streams, such as organic waste, plastics, and hazardous waste requires an in-depth understanding of the university's operations. Also, stakeholders have diverse opinions and preferences regarding waste management practices, making it challenging to find common ground and design a system that satisfies everyone. Furthermore, identifying types and sources of waste produced involves waste assessments, surveys, and collaborating with individuals and clubs such as the sustainability club. Another source of wickedry arises from the fact that waste generation patterns may evolve due to a change in consumption patterns of individuals in the institution, requiring ongoing data collection and analysis to remain effective. Moreover, in a university setting, assessing the impact of waste management involves considering how these initiatives affect the broader community. For example, how these initiatives impact the behavior and awareness of students, faculty, and staff is challenging to measure quantitatively. Similarly, measuring the participation in waste reduction efforts adds to the same problem. It is also worth considering the financial implications of waste management programs. Does the decrease in waste going to landfills offset the increase in costs in collecting and processing waste? These questions make it challenging to evaluate if the proposed remedy will achieve the desired objective.

3.2 Breaking down the problem: Stakeholders

The project requires us to derive a waste sorting and collection mechanism that can be used at HU and later applied to other institutions. Solving this problem requires us to understand the key stakeholders involved in the waste journey at Habib University, as shown in the diagram below. The initial brief focused on gaining insights into Concept Loop. In this subsequent brief, we aim to extend our research to encompass the university environment, specifically targeting two key stakeholders: students/faculty and the university administration.

Our primary objective includes understanding the current waste journey at Habib University, which we plan to do by conducting in-depth interviews with key university administration personnel responsible for waste management. Additionally, we plan to conduct secondary research to explore effective strategies employed by institutions worldwide to promote recycling awareness among students and faculty. Furthermore, we will assess existing sustainability club initiatives and identify limitations. Finally, we will conduct primary research, such as surveys or

focus groups, to gauge student perceptions, attitudes, and behaviors regarding plastic waste at Habib. These steps will help us develop a comprehensive proposal for Concept Loop to purchase the institution's waste to fulfill its raw material needs.

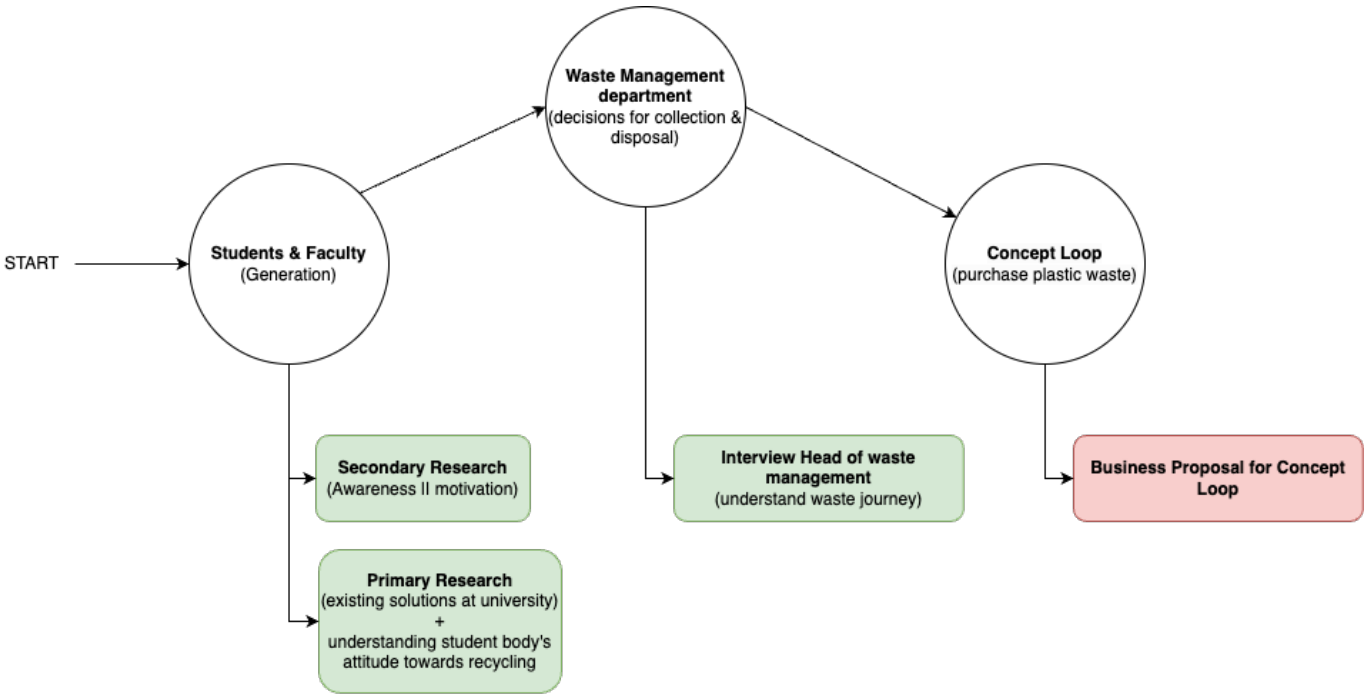


Figure 1: Stakeholders involved

3.3 Waste journey at Habib

When we sought out to work out this problem, we soon realized that we have no idea how this system or the process works. So we decided to do what Tim Brown tells us to do: Gain Insight into the minds of those you're working with. The following are the questions we asked with the stakeholders and their responses.[11]

1. **How many dustbins do we have at Habib University? What is the designated number of staff that deals with waste disposal here?**
   A total of 30 waste bins are installed all around the campus at strategic and well-thought-out spots to prevent littering. However, this does NOT include the smaller bins placed within all of the classrooms and offices around campus. The duty to manage the waste bins and dispose of the trash inside is assigned to 4 esteemed TCT(The caretakers) staff members, who ensure their effective disposal.

2. **What quantity of waste is produced at Habib University every day?**
   For convenience, Waste Management at Habib University prefers to quantify the collected waste in terms of the number of waste bags utilized each day instead of the weight of each bag. According to this metric, out of 30 used waste bags, 8-10 bags full of trash are produced each day, comprising the waste collected from the big dust bins placed around the campus.

3. **How often are the bins emptied in a single day?**
   All the bins on campus are emptied once every day, at the end of the day. This operation is carried out by four members of the TCT staff who have the designated responsibility of emptying the bins and disposing them in a sizeable dump. This dump is specifically assigned to Habib University's waste and is located right outside the boundaries of the campus.

4. **What is the cost breakdown of the expenses beared by Habib University daily in the waste collection process?**

   Since there are a total of 30 waste bins installed around campus, 30 of the 36x50 inch trash bags are used each day. These make up a total of 4.5 kgs of trash bags, bringing down the cost of the trash bags used daily to Rs. 1499.851500. Apart from this, hidden charges may occur in the maintenance and cleanliness of the installed bins. Furthermore, in conversation with the Waste Management Department at Habib, an additional sum of Rs. 1500 was quoted for the collection of extra waste that might be sorted separately in collaboration with Concept Loop.

5. **Has Habib University ever had previous or ongoing collaborations that were similar?**
   In the past, Habib University has collaborated with an organization called R Waste Management Company. The campaign entailed sorting out the collected trash to promote a recycling culture at Habib University. However, due to logistical reasons, this collaboration was discontinued.

6. **What are the estimated additional costs/responsibilities the involved entities will bear to succeed in our mission of redirecting Habib University's plastic waste to Concept Loop?**
   According to our current calculations and plan of action, investments are required in three important areas. The first is the cost of additional dustbins and waste bags that will potentially be required in setting up portioned bins at Habib University for the effective and speedy sorting process of plastic waste. Secondly, to ensure that the sorting is fault-free and to collect additional waste bags, the cost of labor must also be integrated into the plan. The total amount quoted to us by the Waste Management Department at Habib University is Rs. 1500/day for the aforementioned points, respectively, making it a total expense of Rs. 3000 daily. Lastly, it is also crucial to us that to make this plan hassle-free and convenient for the university, just like their current waste collection system, we come up with a mechanism through which the sorted out waste can be collected by Concept Loop from the University in its entirety. The plastic portion will be used for further processing by the social enterprise while also bearing the responsibility of the disposal of the remaining waste.

3.4 Secondary Research: Methods employed Worldwide

This section examines various methods universities and institutions use to instill awareness about plastic waste sorting among their students. Understanding how students are motivated and identifying the factors that encourage their active participation in waste management initiatives will inform the development of a tailored awareness program for Habib University.

In a study by Yusuf and Fajri [1] in Indonesia and Liao and Li [2] in China, differences in students' behavior regarding waste management were observed based on their majors in either sciences or social sciences. The findings indicated that students majoring in environmental sciences tended to exhibit more favorable behavior scores than their social sciences peers. This could be attributed to their access to greater information and curricula emphasizing environmental topics. Another study by Situmorang et al. [3]in Taiwan enhancing students' awareness through environmental education and promoting participatory environmental programs emerged as a potential solution to address the problem of plastic waste. Similarly, a study done in Romania identified students' awareness as the most important factor in influencing their behavior towards recycling waste.[4] In 1995, Glenda Hanna concluded that knowledge and preceding factors affect the student's attitude, action, and behavior to protect the environment. This is represented using the diagram below. Chuanhui Liao and Hui Li[6] bring forth an interesting finding by studying 562 Chinese high school students. While they emphasize that environmental education is essential for separating solid waste on campus (SSWC), the absence of approval and encouragement from their friends and family can hinder students from actively participating in these initiatives.

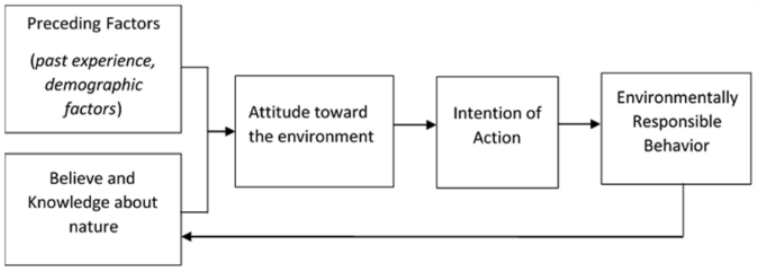


Figure 2: The concept of environmental behavior change

Barriers to Recycling Behavior

The following barriers to recycling behavior were identified in recent research studies:

1. **Lack of Knowledge and Confusion (Capability)**: Individuals often lack knowledge about how to recycle plastic waste, leading to confusion. Many are unsure which types of plastics should be placed in specific recycling bins [8]

2. **Unclear Recycling Instructions (Capability and Opportunity)**: Recycling instructions are frequently unclear or ambiguous, contributing to capability and opportunity barriers. Participants reported that visual cues, such as the triangle symbol, commonly cause confusion. Lack of clear recycling instructions at the point of disposal results in items being thrown into general waste bins [8]

3. **Perceived Lack of Priority (Motivation)**: A significant barrier to recycling is the perception that it is not a priority in the context of individuals' busy daily lives and responsibilities. This lack of motivation to recycle is often linked to perceived inconvenience.

4. **Insufficient Physical Opportunity (Physical Opportunity)**: Insufficient access to recycling facilities and inconveniently located recycling bins hinder recycling efforts. Recycling is perceived as difficult due to limited physical opportunities [8]

5. **Insufficient Automatic Motivation and Social Opportunity (Automatic Motivation and Social Opportunity)**: Lack of automatic motivation and social opportunity is a barrier to recycling. Participants noted a lack of social norms and incentives to recycle, reducing their motivation [8]

Participant Quotes: Following the same philosophy of gaining insights, our secondary research brought to life another stakeholders point of view into light: What are the producers of the trash thinking ? What are the problems they face, and how can we address them, we found that the following quotes to sum up most of what they feel.

- "Visual cues in current designs add to the confusion. The triangle symbol generally confuses; only two respondents understood its function."

- "If the information isn't presented to me at the forefront when I need it, I just throw that into the black bin, the black bin being the general waste bin."

- "I have to infer, I have to check locally for recycling information because it doesn't say. But it's more of like a heuristic—when tired, I would never impose upon myself to go out of my way to find out more information about recycling or go to more effort. When I have individual resources depleted, like, I am tired, or things are not going well for me, if it is not made easy for me, I will just not bother." (ID23) [8].

Distance and Recycling Participation

In another study, the role of distance in recycling participation was examined. The study found that, at least in this case, and 11 months after the recycling program was launched, there is no variation in distance among those who do participate. The number of days they deposit recycling in a month does not vary with distance. This suggests that the current static behavior change models may not be sufficient for understanding and planning recycling programs. The study recommends that researchers make better use of non-static models that consider time-variant drivers for recycling [9].

Key Barriers to Household Recycling

In a different research paper, three major barriers for household recycling were identified, which can be generalized to various locations:

1. **Physical Factors**: Physical barriers, such as the availability and accessibility of recycling facilities and bins, pose significant challenges to recycling.
2. **Effectiveness of Communication/Public Engagement**: Effective communication strategies and public engagement efforts is crucial in motivating recycling behavior.
3. **Influence of Prevailing Waste Policy**: Existing waste policies and regulations have a significant impact on recycling rates and practices [10]

A multifaceted strategy is necessary to achieve high recycling rates and meet recycling targets. This includes a comprehensive review of waste policies, stricter enforcement, improved communication strategies, and integrated development plans to address these complex and multifaceted recycling challenges [10]

3.5 Primary Research: Existing Solutions in Karachi

The purpose of this section is to assess the recycling waste initiatives currently in place at various institutions and organizations. Our objective is to closely examine these programs, identify their limitations and areas for improvement, and draw inspiration from successful practices. By doing so, we aim to adapt and experiment with strategies that have demonstrated efficacy elsewhere to enhance recycling efforts within our university.

Academic Institutions all around Karachi have taken similar measures and established student-run societies under different names like Zero Waste, Sustainability Club, Go Green Society, etc. In conversation with students from The Lyceum College, we found out that previously, they had a highly functional Zero Waste Society. During its tenure, there were multiple measures that were taken to reduce waste, especially that of paper and plastic. For example, liquid soaps packaged in plastic containers were replaced with organic soap bars infused in liquids to maintain cleanliness. Furthermore, utilizing both sides of a printed page for tests or notetaking was imposed on all students and faculty to prevent further waste. Color-coded bins were also placed around campus that signified plastic, paper, and bio-waste. To sustain the club, its members got together to hold bimonthly bake sales to raise money for their campaigns and to self-fund their initiatives. Moreover, different sessions were held to build community engagement and involvement with the cause, including Soap-making workshops, Recycling paper workshops, etc. However, the Zero Waste Society at the said institute is no longer functional. The reason for that is that for two years consistently, they did not have enough sign-ups once the original patrons and leads of the society graduated. Due to the gradual lack of initiative and decline in engagement, many sustainable practices around the campus were also discontinued. Currently, it no longer exists as an official society in the institute and is merely restricted to the role of representatives to oversee the ongoing issues related to sustainability around campus.

3.6 Primary Research: Questionnaire for HU

The primary objective of the questionnaire is to create user personas that provide a comprehensive understanding of our target audience(students/faculty) to build empathy with them. Through this questionnaire, we aim to "understand users' needs, experiences, behaviors and goals". Ultimately, these user personas will be the foundation for developing a final prototype.[7] Following are the questions we plan to include in our survey.

1. **Perceptions and Awareness regarding Plastic Waste:**
   (a) How concerned are you about the environmental impact of plastic waste?
      - Very concerned
      - Somewhat concerned
      - Neutral
      - Not very concerned
      - Not concerned at all

   (b) Do you think plastic waste is a significant issue on the Habib University campus?
      - Yes
      - No
      - Not sure

   (c) Are you aware of the environmental problems associated with plastic waste (e.g., pollution, wildlife harm)?
      - Very aware
      - Somewhat aware
      - Not very aware
      - Not aware at all

   (d) Have you received information or education about plastic waste reduction or recycling at Habib University?
      - Yes
      - No

2. **Behaviors and Practices:**
   (a) On average, how often do you use single-use plastic items (e.g., water bottles, plastic bags, plastic wrappers) on campus?
      - Multiple times a day
      - Daily
      - Weekly
      - Rarely
      - Never

(b) How often do you see yourself actively recycling plastic waste on campus when recycling bins are available?

- Always
- Often
- Sometimes
- Rarely
- Never

3. **Incentives and Motivation:**

(a) Would you be more inclined to use the plastic waste sorting bins if there were incentives or rewards for doing so?

- Yes
- No

(b) What other motivators or strategies could encourage better plastic waste sorting (apart from monetary rewards)?

(c) What improvements or features would make it easier and more convenient for you to sort plastic waste on campus?

(d) Have you ever participated in a plastic waste reduction initiative or event at Habib University (e.g., clean-up drives, and awareness campaigns)?

- Yes
- No

4. **Suggestions for Reducing Plastic Waste:**

(a) What suggestions do you have for Habib University to reduce plastic waste on campus?

5. **Future Engagement:**

(a) Would you be interested in volunteering for or participating in future initiatives to reduce plastic waste at Habib University?

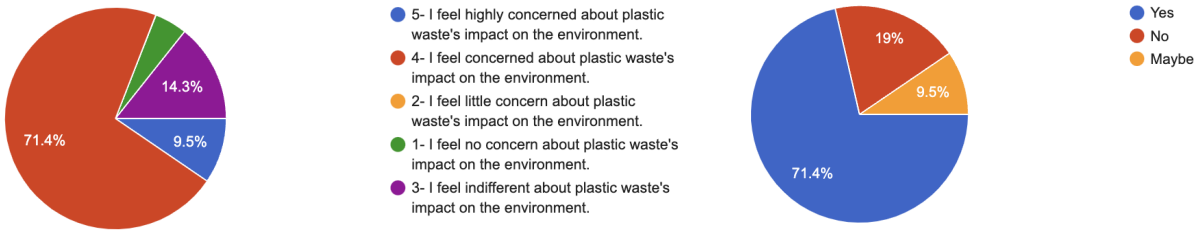
- Yes
- No

(b) How likely are you to support or promote plastic waste reduction efforts to fellow students?

- Very Likely
- Likely
- Neutral
- Unlikely
- Very unlikely

3.7 Questionnaire Results

The questionnaire results suggest that approximately 80% of the respondents feel strongly towards plastic waste and its impact on the environment, with 10% of the respondents feeling very strongly towards plastic waste. However, it is important to note that there were also respondents on the other end of the spectrum that did not care at all about plastic waste although a mere 5%. It is also interesting to note that the exact majority that felt strongly towards plastic waste also believed that plastic waste was a significant issue for Habib University. Essentially, the data reveals that a combined 95% of respondents are aware to some extent of the environmental problems associated with plastic waste. This suggests that there is a general awareness among the surveyed population. The data can inform communication and education strategies. For instance, understanding that a significant portion of respondents is only "somewhat aware" might suggest the need for more targeted and effective awareness campaigns to bridge the gap.The following survey results highlight the above claims.



(a) Concern about the environmental impact of plastic waste

(b) Plastic waste issue at HU

Figure 3: Question responses from survey

The silver lining is the fact that there has been some work done in this regard and is in the social memory because 23.8% of the respondents claim to have received information regarding plastic waste at Habib. This indicates that a significant portion of the student body(76.2%) ave not received information or education about plastic waste reduction or recycling highlights a significant lack of awareness within the university community. This presents a clear opportunity to implement educational initiatives to raise awareness about plastic waste reduction and recycling. However, before we proceed with awareness programs it will be important to explore the reasons behind this lack of education. Is it due to the absence of educational programs or students not engaging with existing initiatives? The diagram below shows the percentage of students who have received any sort of information about plastic waste reduction.

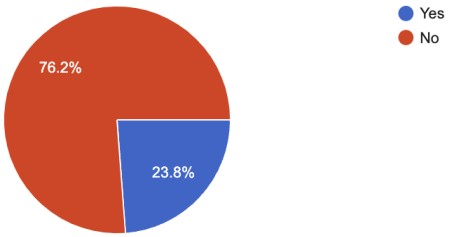


Figure 4: Percentage of students who have received information from University

Furthermore, 90% of all respondents say that they would be more willing to recycle if there were recycling bins on campus. This is a positive starting point for promoting recycling efforts. The presence of recycling bins is a significant driver for recycling behavior. This data suggests that making recycling bins more accessible and visible on campus is crucial for increasing recycling rates. Therefore, campus authorities can prioritize investments in the installation of these bins. However, as the diagram below suggests the slightest inconvenience will immediately

cause 60% of the student body to stop putting in the extra effort.This serves as a reminder that the bins are not only easily accessible but also easy for students to use for disposing of their waste.

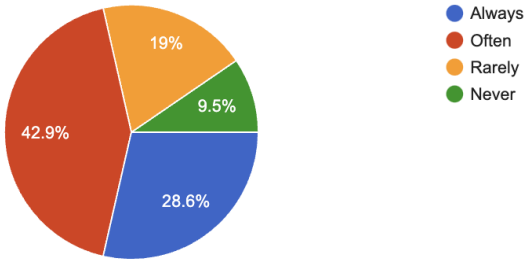


Figure 5: Percentage of students willing to recycle

Moreover, 53% of all participants expressed that they would happily volunteer in initiatives to reduce plastic waste. Volunteers can actively encourage and inspire their peers who may not have initially expressed interest in volunteering. Their passion and commitment can be contagious, motivating others to join in efforts to reduce plastic waste.

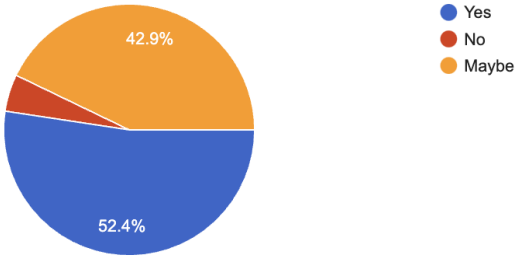


Figure 6: Percentage of student willing to volunteer

Regarding the use of Single Use Plastics, 30% of respondents use single-use plastics one time a day, while 20% of respondents believe that they use a single-use plastic at least once a day, while 8% of the respondents claim to not use single-use plastics at all. The frequency of single-use plastic usage data allows for an estimation of the volume of waste that needs to be managed. With an understanding of the waste generation patterns, campus authorities can make informed decisions regarding the sizes of bins and plan efficient waste collection schedules.

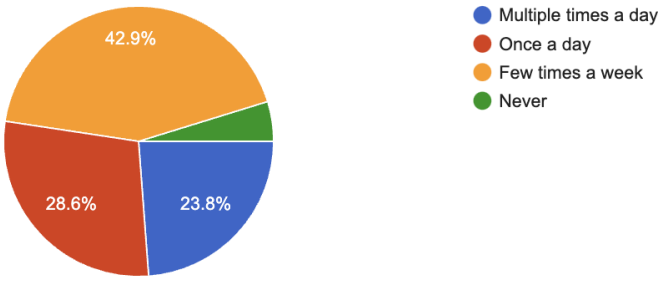


Figure 7: Amount of plastic consumed

3.7.1 Suggestions to reduce plastic waste on campus

In response to the community's concerns, several specific suggestions were made to address plastic waste and foster a culture of sustainability at Habib University. These quotes highlight the community's desire for practical changes that can reduce the use of plastic and promote sustainability.

- "More water coolers with actually cold water so we don't keep getting new water bottles."
- "Don't serve cafe to go food in plastic boxes."
- "Glass bottles for drinks, paper straws."
- "Replacing plastic shoppers/bags with paper bags."

3.7.2 Potential features to make the sorting process convenient

Furthermore, to address these concerns and encourage sustainable practices:

- "Inculcate a culture around plastic waste in Habib."
- "Sorting bins available everywhere with labels and description."
- "Classifying them as plastic and 'others'."
- "More prominent recycling bins, maybe with brighter colors."

These quotes highlight the potential for institutional changes and the community's willingness to participate in initiatives to reduce plastic waste.

3.7.3 Motivators/strategies to improve plastic waste sorting

Before embarking on the design of our own solution, we have actively sought and valued the feedback of the student body. This feedback will play an integral role in shaping the development of our first prototype, ensuring that it reflects the collective preferences and needs of our campus community.

- Awareness campaigns appealing to the ethos, pathos, and logos of the community.
- Awareness of what classifies as plastic
- Gamification - add fun to recycling
- Vouchers, awareness sessions, Reward point system

3.8 User Personas

The questionnaire results have been used to create user personas that comprehensively understand our target audience(students/faculty) to build empathy with them. Through this, we aim to "understand users' needs, experiences, behaviors and goals".[1] Ultimately, these user personas will be the foundation for developing a final prototype.

Nadia(Student) against recycling

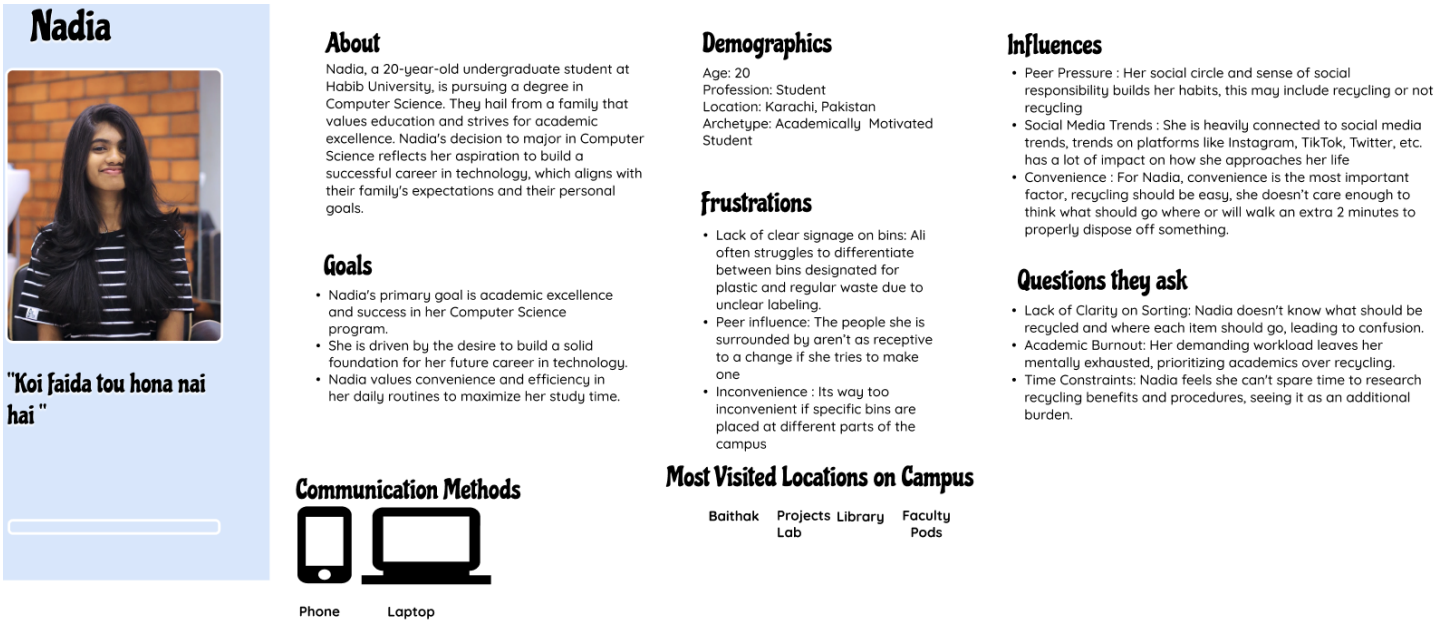


Figure 8: Persona against recycling

Ali(Student) for recycling

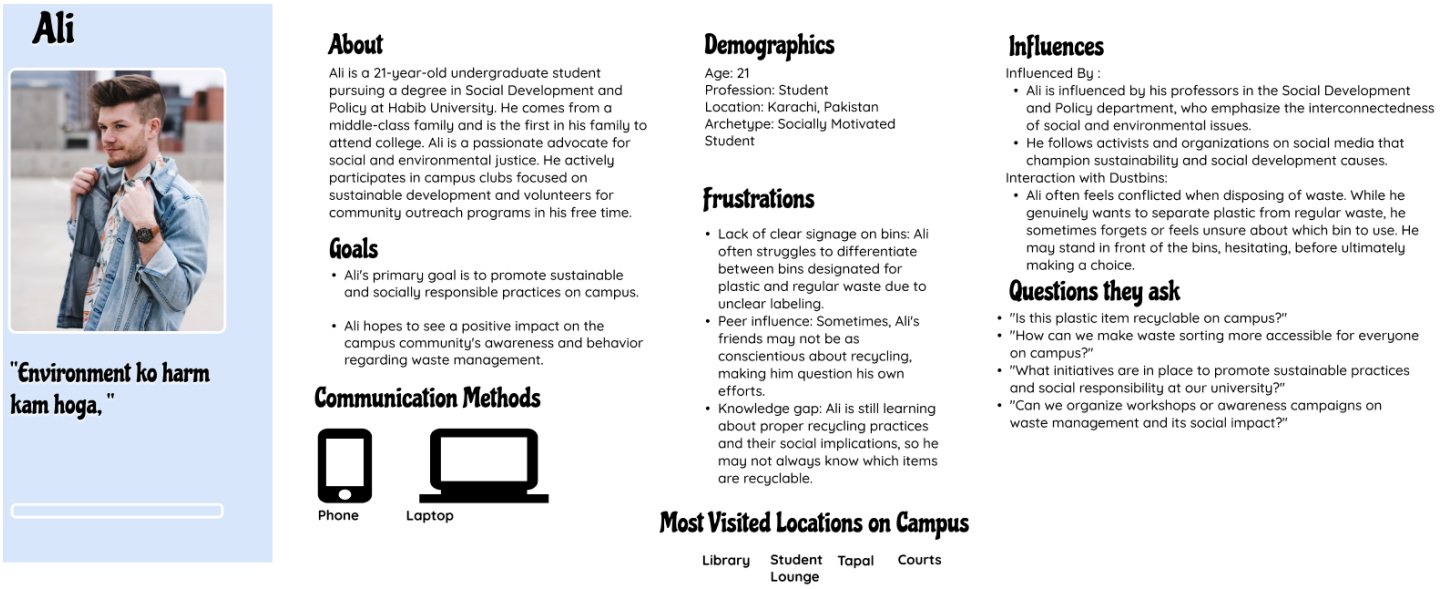


Figure 9: Persona for recycling

Zubair (Admin)

Zubair Iqbal

"Aisay nai hota, poora system change krna parega"

About

Zubair started working as an intern at a school-office back in his mid-20s and has since made his way into middle management. At Habib University, he is tasked with overlooking the logistics at Habib, his skillset is his experience that he has accumulated throughout his life

Goals

- Make enough money to retire comfortably
- Get recognition for his hard work
- Get the highest salary possible
- Do his daily work and go home to his family

Communication Methods

Phone

Laptop

Demographics

Age: 21
Profession: Student
Location: Karachi, Pakistan
Archetype: Socially Motivated Student

Frustrations

- Administrative Processes: Dealing with occasional administrative procedures can slow down decision-making.
- Introducing New Processes: Zubair may need to implement new logistics processes, requiring effective communication and staff training.

Most Visited Locations on Campus

Admin Office

Parking Lot

Mehfil

Influences

- University Policy: University policies play a significant role in shaping Zubair's decisions and actions. He must adhere to these policies while managing logistics and making changes to the system. These policies can dictate how waste management is conducted on campus, impacting the number of dustbins, disposal methods, and other logistics-related aspects.
- Industry Practices: Zubair may draw inspiration from industry best practices when managing logistics. Staying updated with how other institutions or organizations handle similar challenges can provide insights and ideas for improvement.
- News Channels: Current events and news can also influence Zubair's decision-making. Environmental concerns, waste management regulations, or emerging technologies in logistics and waste disposal may be topics of interest that he comes across through news channels. Such information can shape his approach to managing dustbins and waste at the university.

Questions they ask

- Why are you adding more dustbins, they are already a pain to deal with, never the mind that you want to add more dustbins, this will only increase my work with no additional pay.
- How is this even beneficial : How will this benefit Habib University and Habib in the long and short term. This is just increased cost and complexity to our system.
- What will happen if you implement this system and your clients stops working with us, the money and time will be wasted.

Dr.Sarah Ahmed (Faculty)

Sarah Ahmed

"I like to recycle, but sometimes its way too complex"

About

Sarah grew up in a household that prioritized education and personal freedom, she spent the majority of her life in education and in the service of academia, after doing her bachelors from Pakistan, she worked in the field for a while before doing her masters and gaining her phD in Political Science and is now a lecturer at a University in Karachi

Goals

- Dr. Sarah Ahmed's central focus is on her work and academic pursuits, which take precedence over environmental concerns, including recycling.
- Her primary goal is to excel in her academic career and fulfill her life mission.
- While recycling is important to her, it is not her top priority.
- She acknowledges the importance of recycling but often finds it challenging to prioritize due to her busy schedule and responsibilities

Communication Methods

Phone

Laptop

Demographics

Age: 37
Profession: Lecturer
Location: Karachi, Pakistan
Archetype: Socially Concious Middle Aged Professor

Frustrations

- Time Constraints: Dr. Ahmed's demanding schedule, which includes teaching, research, academic committee participation, and mentoring, leaves her with little free time. This limited availability makes it challenging for her to engage in activities like recycling that require time and effort.
- Work-Life Balance: Achieving a balance between her academic pursuits and personal life is an ongoing challenge. Dr. Ahmed often finds herself working long hours, which can occasionally lead to burnout

Most Visited Locations on Campus

Classroms

Faculty Pod

Conference Rooms

Cafeteria

Influences

- Academic Colleagues: Close relationships with faculty members provide support and collaboration opportunities.
- Students: Inspired by students' enthusiasm, contributing to her passion for teaching.
- Research Collaborators: Collaboration motivates her to strive for excellence in her field.
- Research in the Field: Keeps her informed about the latest developments and theories.
- International News: Broadens her global perspective.
- Societal Norms: Shapes her teaching and research approaches.

Questions they ask

- Are there local or university-led sustainability programs that I can participate in or support, even if my schedule is tight?
- How can we educate people about which portion of the bin should their trash be placed in?
- What role can different stakeholders such as faculty members play in ensuring the adaptation of sustainable practices at Habib University?
- How can we involve different clubs and student-run entities in this cause and get everyone to make a collective effort to solve this problem?
- Where do plastic bottles go Are the cans being recycled ?
- Should I throw the biscuit wrapper in the plastic bin or the non-plastic bin ?
- There is no marking on the Limca Cup, where do I throw that ?

3.8.1 User Journey Map

This diagram provides a quick overview of Nadia's goals and thoughts at each stage of her day. By visually representing her priorities and behaviors, you can easily identify points where interventions can be effective.

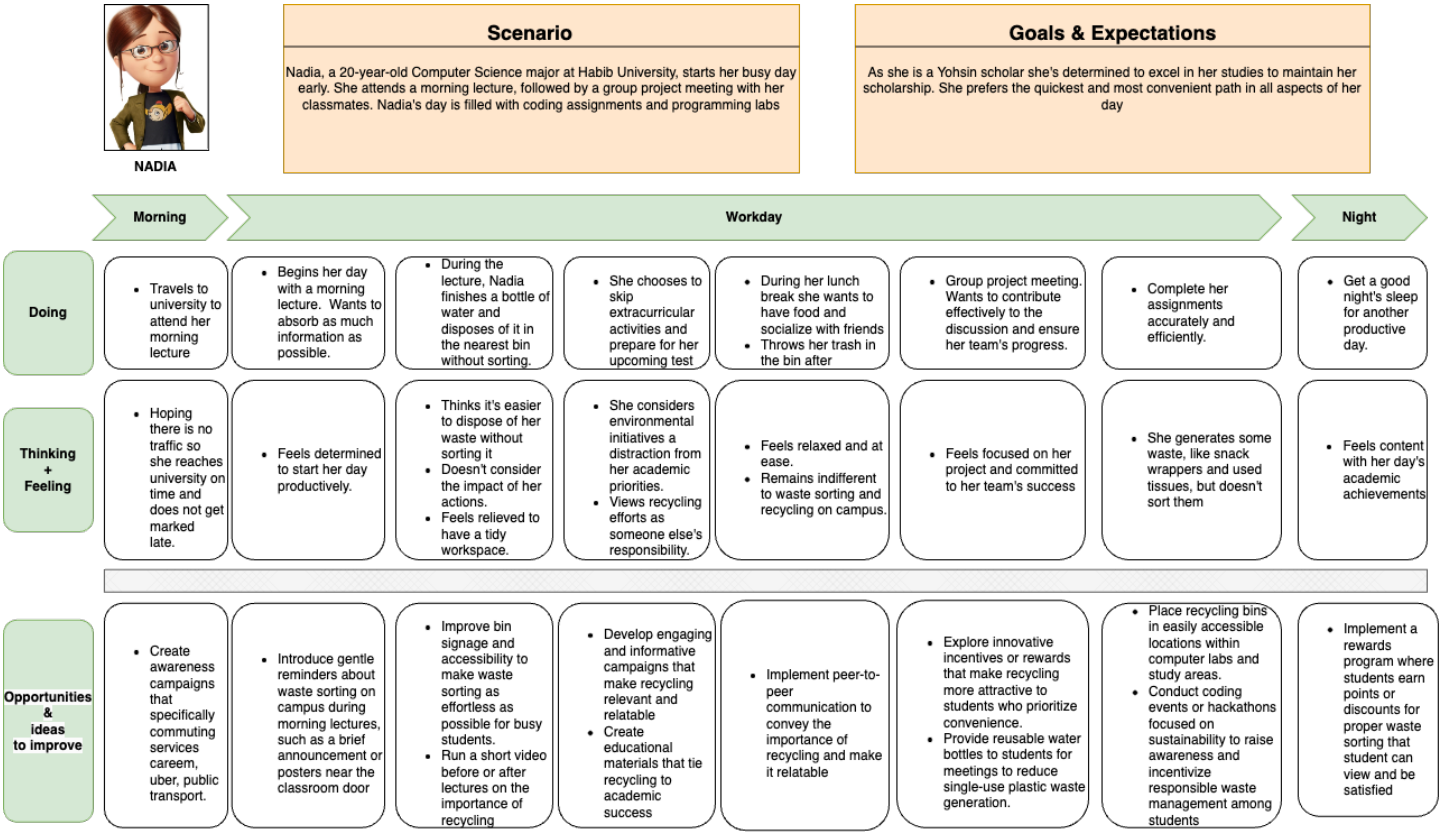


Figure 10: Nadia's User journey map

3.8.2 How might we questions

The goal is to create questions that "provoke meaningful and relevant ideas".[2]

1. How might we make it easier for students like Ali to distinguish between bins for plastic waste and regular waste?
2. How might we raise awareness about the social and environmental impacts of proper waste sorting among the student body at habib University?
3. How might we encourage students to actively engage in waste reduction efforts on campus?
4. How might we leverage Ali's passion for sustainability to create a campus-wide recycling initiative?
5. How might we incorporate gamification or incentives to motivate students to consistently sort their waste correctly?
6. How might we improve the signage and labeling on the waste bins to provide clearer guidance to all students, including those who may not be as environmentally conscious as Ali?
7. How might we integrate waste sorting and sustainability education into the curriculum for students at the university?

8. How might we create a sense of community responsibility and accountability among students to ensure proper waste sorting and recycling practices?

9. How might we measure and track the progress of waste reduction efforts on campus to continuously improve our initiatives?

10. How might we collaborate with Concept Loop to make the recycling process more transparent and engaging for students?

3.8.3 Bonus: Alternate design thinking approach

We intend to use the SCAMPER method to comprehensively combine our ideas and give them a direction. By applying the features of this methodology to our personas and primary research findings, we aim to structure our ideas in a way that would enable us to create a free-of-fault product that would cater to the needs of all its users. Here is how we plan on making it work for us:[3]

1. Substitute: Through the method of substituting, we will analyze the faults of the existing waste disposal model that make it an inconvenience for its users. By doing so, we aim to eliminate that part of the design and inculcate a feature that makes the disposal system easily accessible and convenient for everyone.

2. Combine: Through the substitution feature, it is inevitable that a wide range of creative ideas will be coined in our minds. In the combining phase, we will analyze our ideas to combine them to make a model that possesses all the required features that make it the best fit for the users.

3. Adapt: By adapting design thinking and the scamper method, we intend to come up with a model that can be replicated in other institutes and contexts, with the underlying aim being the same, i.e., redirection of plastic waste to Concept Loop, to encourage the adaptation of sustainable practices in Pakistan.

4. Modify: Apart from building a new mechanism through which waste can be sorted, we will also ensure that we analyze closely the pre-existing models of waste disposal and how they can be modified or rectified to facilitate the adaptation of waste sorting practices

5. Put to another use: Besides the aimed sorting mechanism of plastic, we will also be focusing on different methods through which a dialogue can be created within the society concerning environmental damages that we cause and what measures can we take to counter its already prevailing effects

6. Eliminate: It is important to observe flaws in any model, and after doing so, we aim to remove them from our model to ensure that we take into account the ideas and opinions of our users and put them to use. For example, many spoke against the establishment of color-coded bins at different locations since that be more time-consuming. Instead, many showed interest in an all-for-one portioned or sectioned bin instead.

7. Reverse: It is also important to consider rearranging the order of different steps that we plan on taking in designing a waste sorting mechanism. For example, according to our initially planned agenda, we were to consult the student body about their opinions on our sample prototype after its installation around campus. However, instead of going with that approach, we decided to first consider the expectations of the student body, then proceed to the current stage of understanding our users' needs, and finally, come up with a mechanism to cater to that.

4 Prototype Development

4.1 Design and Prototyping of Transparent Recyclable Trash Bins

- **Objective:** To create innovative, eco-friendly trash bins, making recycling contents visible, and feature lightweight, minimal frames to ensure cost-effective manufacturing.
- **Material Choice:**
  - Initially explored using recycled plastic bottles to construct the bins, which effectively conveys the recycling message but could create misconceptions about bin usage.
  - Considered an alternative approach using transparent plastic trash bags that align with the campus aesthetic while being less overt with the messaging.
- **Frame Design:**
  - To enforce the idea of cheap manufacturing, we opted for either 3D printed parts or parts made of thin steel rods for the frame construction or plastic materials such as water bottles themselves.
  - The choice of materials ensures cost-effectiveness and ease of dispatch for mass production.
  - Transparency in recycling bins serves as a form of social accountability as individuals can see what others are disposing of.The fear of being held accountable by the community can be a compelling incentive for individuals to dispose of their waste properly.

(a) Trash bin made from plastic bottles

(b) Trash bin made of Metal Frame

Figure 11: Dustbins made from different materials

- **Immediate Feedback:**
  During the class activity, when the image of the dustbin made from plastic bottles (a) was displayed to the students, some interesting responses were received from the participants. A few students expressed concerns that the design might inadvertently convey the message that only water bottles should be disposed of in this particular recycling bin. It was noted that this perception could lead students to dispose of other types of plastic waste in the regular trash bins, assuming they were not meant for the recycled plastic bottle bin. This feedback raises a valuable point about the importance of clear communication and messaging in encouraging recycling efforts. A couple of solutions were suggested during the discussion to address this concern and ensure

that the recycling initiative is as effective as possible. It was suggested that clear instructions and signage should be provided. These instructions can be placed near the bins, explaining that all types of plastic waste are welcome in the recycling bins, not just water bottles. Also, Including a simple message like "All Plastic Welcomed Here" could further clarify the intended use of the bin. Furthermore, some students also expressed the opinion that the design of the other dustbin(b), which is not made from plastic bottles, appeared to be more practical. This viewpoint suggests that while the recycling bin made from plastic bottles is innovative and creative, there may be aspects of the alternative dustbin design that are seen as more functional or convenient for everyday use.

- **Gamification:**
  We propose the exciting addition of gamification elements to our dustbin design, featuring a hoop that invites participants to toss their plastic bottles into the bin. Our aim is to infuse a sense of energy and enthusiasm into the waste sorting process, offering a fun and interactive way to encourage active participation. According to our surveys conducted, sorting plastic waste is perceived as a tedious and boring process, which is why we're introducing this element of entertainment to stir up initial excitement and engagement. The idea for gamification works well in this approach given that there is very little incentive for a passerby to use the plastic-only bin rather than the usual bin, and habits needs some initial push.

  However, we acknowledge the need for a cautious approach as things could potentially get rowdy in a university setting. To address this concern, we are committed to conducting thorough testing and evaluation to ensure the practicality and safety of this feature within our campus environment. It is crucial to maintain a balance between excitement and responsible use, and we will monitor the gamification impact closely to ensure it aligns with our broader goals of fostering recycling and sustainable waste management, all while maintaining a safe and harmonious campus environment.

Figure 12: Gamification idea

4.2 Signage on bins

- **Objective:** To eliminate confusion while disposing off waste.
- **Purpose:** Our primary research through survery indicated that there exists confusion in what is regarded as plastic. As simple as it sounds, it is important to note that students are not willig to put extra thought into disposing off their waste in their already hectic schedules. Therefore, it is important that we simplify this process for them by helping them dispose of the right material in the correct bin.

4.2.1 Clear Guidelines for Trash Separation

1. Alongside the recyclable bin prototypes, we intend to provide succinct guides on what types of trash belong in each bin.
2. These guides will include clear instructions to ensure proper separation of recyclable materials from non-recyclables.
3. The goal is to educate users and encourage responsible recycling practices, reducing contamination in the recycling stream.

4.2.2 Varied Bin Placement and Monitoring

1. To maximize the impact of our campaign, we plan to deploy different variations of the recyclable bins in locations where trash is most generated across the campus.
2. QR codes will be placed near these bins, allowing users to access surveys for feedback and suggestions.
3. We will also monitor the amount and types of waste generated, observing if any non-plastic items are disposed of.
4. This data will help us adapt and optimize our recycling efforts based on the specific needs of each location.

Figure 13: Poster to be put up on bin

4.2.3 Prototype #1

(a)

(b)

Figure 14: c

4.2.4 Prototype #2

(a) (b)

Figure 15: Gamified bin

4.3 Poster on bin

4.3.1 Prototype #1

Figure 16: Project Strategy framework

4.3.2 Prototype #2

Figure 17: Project Strategy framework

4.4 Awareness and Marketing Planning

Objective: To educate the public about sustainability and responsible recycling practices.

4.4.1 Prototypes

A campus-wide plastic drive aims to bring together the entire community of Habib University and encourage a more unanimous approach to tackling the issue of excessive plastic usage and its lack of recycling. As of now, according to Mr. Nimroz (head of waste department) of all the waste Habib University produces, a significant quantity is that of plastic. In collaboration with Concept Loop, we aim to put this plastic to good use by adopting sustainable practices around the campus. The first of such attempts is the plastic drive that we aim to organize, which will be divided into two phases.

4.4.2 Phase 1: Prototype Building

Currently, Team Concept Loop is working on its sample prototype which will be primarily made using recycled material. If successful, we aim to create multiple similar models to be placed around campus, to ensure that the process of plastic collection goes smoothly. That being said, for the creation of replicated models of our prototype, we are striving to bring the entire community together and accept this cause as their own. We will invite the entire student body and the faculty, to contribute to our campaign by donating any and all plastic bottles that may be no longer useful for them. While this material is the most integral part required to build our bins, we will also be accepting other plastic waste in order to provide our community with a system of responsible and redirected disposal. Using their provided material and help, we plan on making our prototypes, the product of which will be a symbol of Habib University's unity towards a common goal.

4.4.3 Phase 2: Monthly Plastic Drives

The accumulation of plastic in households is not uncommon. It may be in the form of shampoo and soap bottles, takeout boxes, or single-use plastic water bottles. It is unfortunate that communities in Pakistan do not have an effective recycling mechanism through which plastic waste can be reused for the better. That being said, through our monthly plastic drives we intend to give the student body an opportunity to play their part in being responsible members of society. Every month, we will request them to gather all the plastic waste they wish to dispose of and hand it over to us. Further events can be held for community engagement in which students can come together and volunteer to sort out the plastic waste we collect from the student body. These drives can be incentivized by asking Concept Loop to provide some of their lifestyle products as gifts for students who choose to volunteer for these drives.

4.4.4 Collaboration with Sustainability Club

In order to make sure that our attempts to tackle the issue of plastic sorting at Habib University are unanimous, we plan on making potential collaborations with the Sustainability Club. By doing so, they can take this mission forward and hold multiple awareness sessions highlighting the importance of recycling and also arrange workshops that promote the adaptation of a more sustainable lifestyle.

Their role in this collaboration would be to help us promote the usage of our plastic bins within the community and create awareness about it. Furthermore, along with our help, they will also be creating relevant content like posters and social media posts, etc., to inform the study body about the actions being taken, the progress, and any other updates to keep the community engaged. Ideally, updates will be in the form of bulletins provided by Concept Loop highlighting what products were manufactured using the plastic waste provided by the university.

Lastly, they will also play a vital role in helping us gather a team of volunteers that will allow us to effectively manage the collected material from the plastic drive, and also sift through the plastic waste from when we set up our sample prototype on campus.

4.5 Proposal for Semesterly Plastic Collection Drive

4.5.1 Introduction

The purpose of this proposal is to introduce a semesterly plastic collection drive at Habib University. This initiative aims to encourage students, staff, and faculty to donate single-use plastic materials they have at home, thereby contributing to environmental sustainability and raising awareness about plastic waste reduction.

4.5.2 Objective

The objective of the plastic drive is to collect and responsibly dispose of single-use plastic materials.

4.5.3 Proposed Activities

- Collection: Students, staff, and faculty will be encouraged to participate by donating plastic materials.
- Sorting and Packing: Collected plastic will be organized and packed into garbage bags.
- Storage and Collection: Plastic bags will be stored with the cleaning staff and collected by Concept Loop.

4.5.4 Timeline

The plastic drive will take place once a semester. Collection will occur well before the final exams, so that students do not have to worry about the part they have to play in this campaign. Moreover, sorting and packing can be done by student volunteers during convenient time slots that we will assign for them to select as per will, and external collection as soon as we are ready with the packing of plastic waste.

4.5.5 Volunteer Participation

Student volunteers will be recruited by general sign-ups. Their roles will include collection, sorting, and packing of plastic materials.

4.5.6 Collaboration

We plan to collaborate with the Sustainability Club to help us execute this event, and with Concept Loop to ensure responsible collection and disposal of collected plastics.

4.5.7 Environmental Impact

This initiative will significantly reduce the amount of single-use plastic waste on campus, promoting environmental sustainability and reducing the carbon footprint.

4.5.8 Resources Required

Resources needed on our end for the drive include collection bins/cartons, garbage bags, and promotional materials like posters, etc., to spread the word about the campaign.

4.5.9 Budget

The campaign as of now would be self-funded before we officially have Concept Loop on board with us.

4.5.10 Promotion and Awareness

To promote the event, we will utilize university communication channels, Habib's unofficial social media groups, and posters around campus. Awareness campaigns will educate the university community on the importance of plastic waste reduction and also about why they should become an active contributor to the campaign.

4.5.11 Sustainability

The plastic collection drive aligns with the university's mission, supporting our commitment to reducing environmental impact.

5 Testing

5.1 Introduction

Testing our bin was the most anticipated step of our project. Being one of the first few recycling initiatives taken at Habib University, we had to have on board, various stakeholders who enabled this process and allowed us to install our prototypes timely. This section of the report would cover the methods and strategy we used to get the best possible results, the process of waste monitoring and collection, the results of our findings and then ultimately, the key takeaways and potential adjustments we still further make to better the prototype.

5.2 Methodology

The Waste Management Department at Habib University played a great role in ensuring that this project was seamlessly executed. They gave us full liberty to practice anything we would want for the betterment of the community and adopting up good practices. Our group was directly in contact with Mr. Nimroz with whom we met initially to discuss the costing of our prototype. After that, we met with him multiple times to fill him in on our prototype development and take constructive feedback for improvement.

On their suggestion, we also installed a stronger base to our prototype which prevented that dissemination of waste incase of a tear in the trash bag. Finally, our prototype were installed in front of Cafe 2 Go and in Tapal Cafeteria on Monday, and we were ready for a 3 day-analysis. Mr. Nimroz also kindly agreed to keep a lookout on our installed bins and requested his workers to inform us when they are full so that we could go over and analyse the trash for further testing and feedback. Moreover, he also took responsibility for changing the trash bags twice a day since after observation, it was realised that the bin filled up pretty quickly.

5.3 Student Community

After the bins were successfully installed, now came the part where we had to propagate awareness about it amongst the Student Community.

For that, we chose to actively spread it through word of mouth and would indulge in conversations with our friend circle and educate them about the impact of plastic on Earth, and then would continue to tell them about an initiative being taken at Habib University about it. Nextly, we took to the Habib University's unofficially Facebook Forum which hosts around 1.1K members of Habib University's student community, where we posted an engaging reel about our finalised prototype and urged the people to show support. We took it upon ourselves to engage them

with a catchy caption and interesting visuals, to convince them to make use of our plastic sorting bins. To do that, we named them "The Plastic Chompers" and make the gamified aspect of it a key feature to gain more attention and popularity among the community.

The pitch went as follows:

AIM FOR CHANGE (pun intended)

If you can't shoot your shot, at least shoot your trash (in our Plastic Chomper!)

Collaborating with a start-up called Concept Loop, we have installed plastic sorting bins here at Habib! You can find them opposite Cafe 2 Go and in Tapal, strategically placed for the easy disposal of your plastic waste.

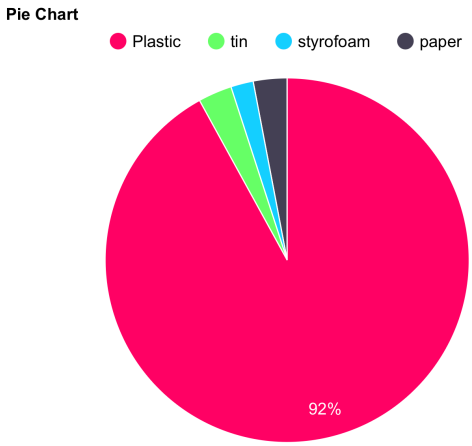
A positive response from the community is highly important and will possibly allow us to push the higher-ups to make plastic sorting a permanent practice at Habib. So here's your chance to be environmentally friendly, while flexing your aim to your friends.

The post received engagement from the community and as a result, the bins garnered more attention and started filling up more quickly than before.

Testing Process The testing was divided over a period of three days in which we divided responsibility to oversee the collected waste multiple times a day and then finally examine it properly at the end of the day after taking it out of the trash bag, supervised by a TCT Staff member.

5.4 Collective Waste Testing Results

On all three days of collection, we were glad to receive a positive response from the community as they were very respectful and mindful of the waste that they threw. However, taking mean of all three days of testing, we received a 2% of styrofoam and 3% of tin. While styrofoam is made up of polystyrene, which is a type of plastic, in a conversation we had with Concept Loop, it was clarified that they are not looking for the said material. That being said we realised that we should maybe specify that in our poster somehow for ease. As for tin, we believe it was either due to carelessness of further clarification is needed for the community.



Apart from that, taking a mean of all days, a total of 3% of paper waste was found in the trash mainly in the form of tissue papers, receipts and juice/milk cartons. This was probably the case because these two things often accompany every takeout people receive from Cafe 2 Go and Tapal, however this is something the community needs to be motivated further to be mindful about since the Plastic Bins are placed right next to the regular bins in which they could possibly put the other trash.

https://drive.google.com/file/d/16jPsht0SwG0IVvurNt7qyEVQGPB1JVLy/view?usp=drivesdk

5.5 Recommendations

What we believe could have been more beneficial to our research, was placing these bins at different, possibly better locations on campus. For example, by the Dhaba where a significant amount of plastic is produced on a daily basis. From our findings, this would have probably been a better placement rather than installing one in Tapal Cafeteria since the amounts of plastic collected on all three days was comparatively lesser than that collected by Cafe 2 Go. Upon further inquiry, the most probable reason from that is that Tapal now used reusable cutlery and has recently switched to paper plates which is something we failed to take into account.

6 Conclusion & Recommendations for Future Study

Throughout the course of this project, our team embarked on a comprehensive exploration of the waste journey at Habib University, with a focused effort on engaging key stakeholders: students/faculty and the university administration. The journey involved a multi-faceted approach, combining in-depth interviews with administrative personnel, secondary research on global best practices, examination of existing sustainability initiatives, and primary research through surveys and prototypes. As we conclude this endeavor, several key insights and reflections have emerged. We gained invaluable insights into the current waste management practices at Habib University, identifying strengths and areas for improvement in the collection and disposal processes. Also, our exploration of international institutions revealed diverse strategies employed to promote recycling awareness. We discerned successful approaches and learned from the challenges faced by others, enriching our understanding of effective waste management solutions. Furthermmore, through surveys, focus groups, and prototype deployments, we gauged the attitudes, perceptions, and reactions of students, faculty, and administrators towards waste management initiatives. This user-centric approach provided a nuanced understanding of the diverse perspectives within the university community. Moreover, the development and deployment of two different prototypes allowed us to observe real-time reactions and gather valuable feedback. This iterative process enabled us to refine our solutions based on user experiences. Given more time and resources, we would conduct a more extensive and longitudinal study to assess the long-term impact of our deployed prototypes and measure how much plastic waste is generated at campus. In essence, the project is a stepping stone towards a greener and more environmentally responsible future for Habib University and beyond.

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