SAPLING GROUP 28

THE SAPLING FRAMEWORK

FIRST EDITION

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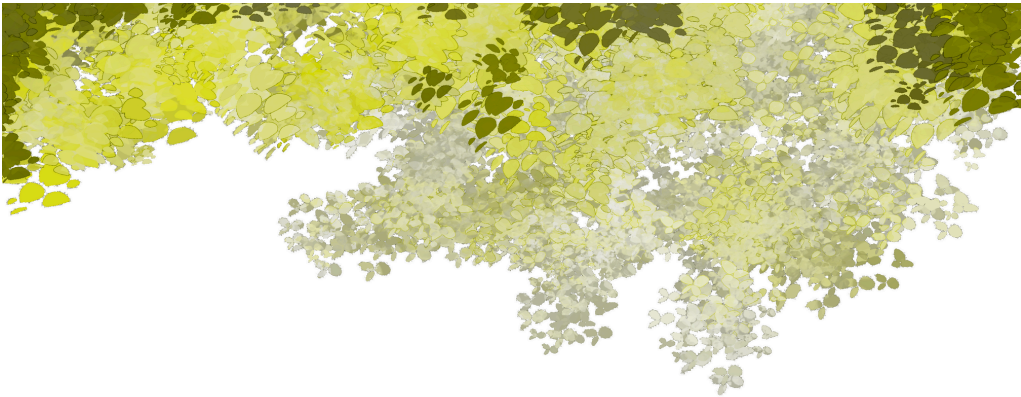
Prof. Samar Sabie



SECTION 1

INTRODUCTION

THE MAKERSPACE

IN A GIST

The ICCIT Makerspace aims to foster innovation and growth but struggles to meet students' expectations, especially for those unfamiliar with its layout and resources.

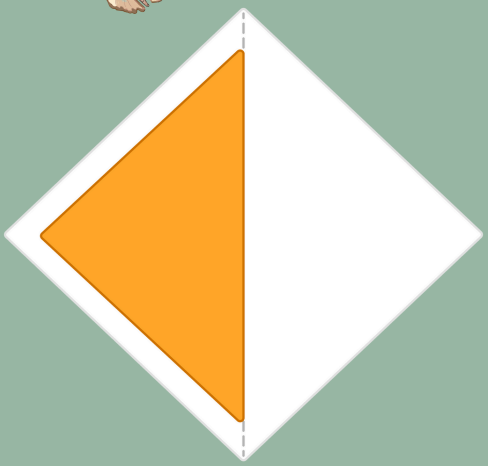
The ICCIT Makerspace plays a crucial role in students' learning experiences by providing resources for project development. Ideally, it should foster innovation and growth, motivating novice and experienced makers to undertake projects that inspire others. However, the question arises (based on the text): Is the ICCIT maker space adequate for inspiring and supporting students to create? Currently, the space falls short of meeting students' expectations, particularly for those unfamiliar with its layout and resources.

Lower- and upper-year students often hesitate to engage fully in creative projects, citing barriers such as unfamiliarity and lack of impactful inspiration.

This paper aims to identify the underlying reasons for this hesitancy among ICCIT students by comprehensively analyzing user experiences using qualitative and quantitative methods, including in-depth interviews, online surveys, and card sorting. The findings will illuminate the key issues affecting students' engagement with the maker space and propose potential solutions to enhance its design and usability.

SECTION 2

Design Thinking Process



RESEARCH

DESIGN

BACKGROUND & MOTIVATION

IN A GIST

Maker spaces need intuitive design and support to bridge the gap between ideas and engagement.

There is a noticeable gap between the initial brainstorming of ideas and the actual engagement in design creation within maker spaces, which poses a significant challenge to fostering innovation. This gap can inhibit the making process, particularly for students who may feel overwhelmed or unprepared to use the tools and resources available.

To address this, examining existing research and experiences from other maker spaces is essential to understanding the factors that facilitate or hinder student engagement. Raina et al. (2018), emphasizes, that for a maker space to be effective, learners must be able to perceive its affordances and understand its constraints (p. 455). In other words, the design environment should be intuitive and user-friendly, especially for novice users, so students can fully grasp its value without feeling overwhelmed.

This perspective aligns with the findings from Moorefield-Lang (2014), who conducted case studies on maker spaces in library settings, such as the implementation of 3D printers.

Through interviews, Moorefield-Lang noted that while many students found the maker space exciting and valuable for self-directed projects, initial hesitancy was common. Students often required specific guidance and support before feeling confident to explore the resources independently.

For example, as Moorefield-Lang (2014) explains; the experience at Richland Public Library highlighted that while some students eagerly embraced the tools after initial assistance, others struggled with unfamiliarity, suggesting that initial barriers in using the maker space could discourage engagement (p. 587).

These observations are particularly relevant to the ICCIT maker space, where similar barriers may exist, limiting students' willingness to engage in projects.

Understanding why students hesitate and identifying ways to lower these barriers are critical to enhancing the space's effectiveness. This research aims to analyze the root causes of this hesitancy and suggest actionable design improvements to better support novice and experienced makers.

DESIGN THE RIGHT THING: EMPATHIZE & DIVERGENCE

METHODOLOGY

IN A GIST

The study analyzes ICCIT students' maker space needs using surveys, interviews, and card sorting within the double diamond framework.

The study employed a mixed-methods approach to explore the challenges and needs of ICCIT students when using the maker space at the University of Toronto Mississauga. Data collection involved quantitative and qualitative methods to understand the user experience comprehensively.

User Group Profile

Lower-year students face challenges such as unfamiliarity with tools and difficulty navigating the space, leading to hesitation; they need basic training and clear guidance to build confidence, driven by the desire to learn foundational skills and explore creative projects (Appendix D, Personas 1).

In contrast, while time constraints and complex equipment limit more experienced, upper-year students, they require advanced training and flexible lab hours to fully utilize resources for challenging projects and achieve innovative outcomes (Appendix D, Personas 2).

Research Plan

The research plan employed three primary methods to gather data: surveys, interviews, and card sorting. Quantitative data was first collected using a questionnaire designed to assess user needs, pain points, and satisfaction levels through Likert scale questions and open-ended responses, helping identify critical issues in the maker space experience (see Appendix A for survey details).

Semi-structured interviews were then conducted to provide qualitative insights into user motivations, behaviors, and emotional responses, employing the **"Five Whys"** technique to uncover the root causes of specific user challenges (see Appendix B for the interview guide and techniques).

Lastly, card sorting tasks helped determine the preferred information architecture, with data collected using Google Forms for surveys and audio/video recordings for interviews and card sorting tasks (see Appendix C for card sorting).

Informed consent was obtained from all participants, ensuring they understood their rights and how their data would be utilized (see Appendix E for consent form and process).

Data Analysis

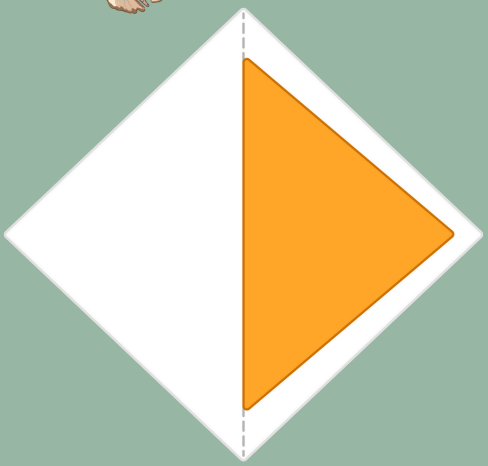
First, the study follows the double diamond model's process of divergence and convergence to identify the final "correct problem." In the divergence stage (empathy phase), extensive content is gathered through secondary research and three primary methods: surveys, interviews, and card sorting.

This step is followed by the execution phase, where affinity diagramming organizes and analyzes the collected user data. The initial findings are combined (Appendix D, Affinity diagramming) with insights from secondary research to identify key user groups and themes, and empathy maps are created for each user group, addressing the "Say, Think, Do, and Feel" aspects.

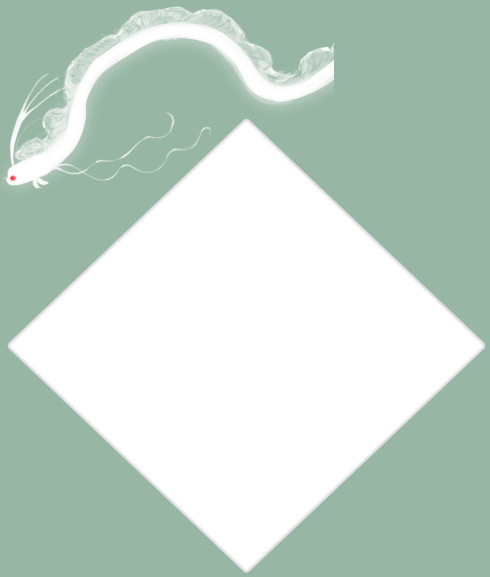
Finally, during the convergence phase, a deeper analysis is conducted to define user needs, motivations, and pain points. Different user groups are identified through further refinement, and personas are developed to represent these groups better. The study concludes by finalizing the user groups and point-of-view statements, ensuring a clear understanding of the problem and user requirements.

SECTION 3

Design Thinking Process



RESEARCH



DESIGN

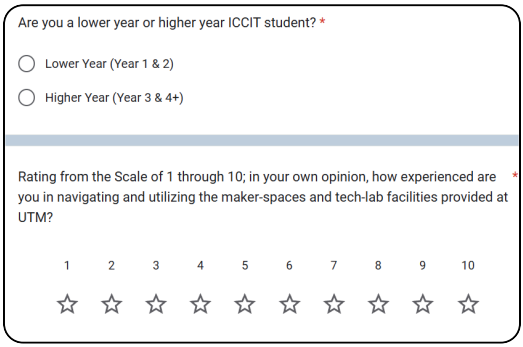
FINDINGS

IN A GIST

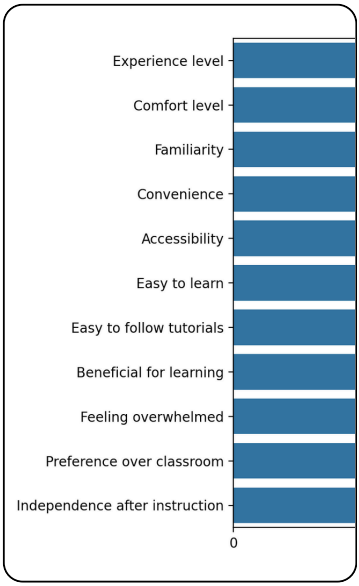
The findings highlight student challenges in the maker space, including tool unfamiliarity and the need for better support.

The survey and interview data analysis reveals critical insights into the ICCIT maker space user experience, highlighting critical areas for improvement. Below are graphs which were formed using **quantitative datasets (Figure 4 -See Appendix)** compiled and collected from the survey.

The questions asked on the online survey assessed the users answers using a point-based system where levels of a certain trait were judged. An example of this could be when the users were asked their 'Experience Level" and they were able to rate their experience on a scale of 1 through 10. This was formatted either in the form of ratings or an 'I strongly agree' to a 'I strongly disagree scale'. This point based data was then collected and stored into excel datasets which allowed a space for numerical quantitative analysis. Using this data, graphs were formed in order to spot trends.



DESIGN THE RIGHT THING: DEFINE & CONVERGENCE



This bar chart (Left side) shows the **average ratings** for each question related to the ICCIT Maker Spaces and Tech Labs. The questions have been shortened for clarity. This is the overall average rating for all ICCIT students who participated in the survey.

Key Insights:

- "Easy to follow tutorials" and "Beneficial for learning" have the highest average ratings, suggesting that students find the hands-on learning approach effective.
- "Experience level" and "Familiarity" have lower average ratings, indicating that students might benefit from more exposure or introduction to these spaces.
- "Feeling overwhelmed" has a moderate rating, which might be an area to address.

FINDINGS CONTINUED

IN A GIST

The findings highlight student challenges in the maker space, including tool unfamiliarity and the need for better support.

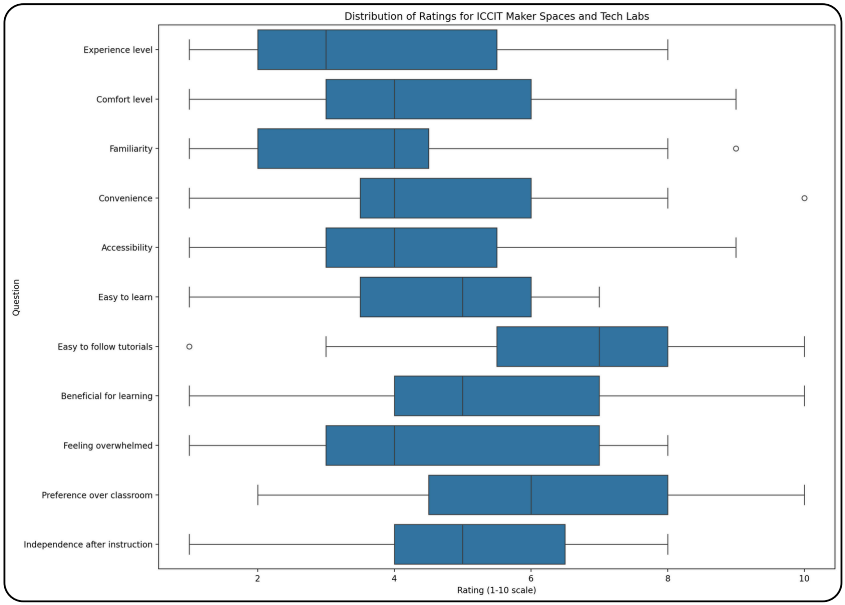
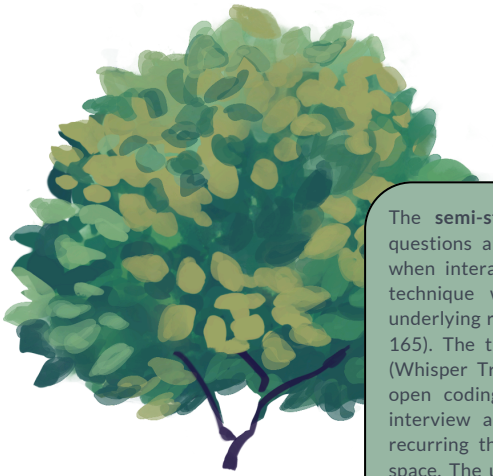


FIGURE 2

This graph **(Figure 2)** shows the distribution of ratings for each question. It provides insight into the spread and central tendencies of the responses. The X scale goes from **1-10**; with 1 being **"Strongly Disagree"** and 10 being **"Strongly Agree"**. The blue boxes show the common point on the scale where the students decided to place their opinion.

Analysis and Trends from the Data

- Most questions have responses spanning the full range (1-10), indicating diverse experiences among students.
- "Easy to follow tutorials" and "Beneficial for learning" not only have high averages but also relatively small boxes, suggesting more consistent positive experiences.
- "Feeling overwhelmed" and "Preference over classroom" have larger boxes, indicating more varied experiences among students.



The **semi-structured interview** framework included key questions about users' emotions, attitudes, and behaviors when interacting with the maker space. The "Five Whys" technique was employed during interviews to explore underlying reasons for specific challenges (Norman, 2013, p. 165). The transcription process involved using an AI tool (Whisper Transcribe) for initial transcriptions, followed by open coding to ensure thoroughness and accuracy. The interview analysis involved coding responses to uncover recurring themes related to user challenges in the maker space. The use of the "Five Whys" technique helped reveal root causes behind common issues, such as a lack of confidence in using unfamiliar tools and a desire for immediate results. For example, several interviewees mentioned feeling overwhelmed by complex equipment, which was linked to a preference for quick outcomes and a reluctance to invest time in skill development.

Transcript

P1:

In a recent interview, I was asked about project experience in CCIT. The project was an assignment for another class, and I spent a lot of time in the early stages thinking about how to complete it. One memorable negative moment was that I finished it just two minutes before the deadline because I needed to find many photos that were difficult to source online, so I had to take them myself, which slowed down the project's progress. The main tool I used was Adobe XD, an app for creating wireframes and prototypes. The biggest challenge I faced was obtaining the photo resources, and Makerspace did not help in this process. Despite the difficulties, I was very proud of the final design because it included some of my favorite elements, and I created a website. After completing the project, I shared it online with my friends, and their positive feedback was encouraging. Reflecting on my first-year projects at the University of Toronto, I realized that teamwork had helped me learn many new things. My classmates and the TA also provided interesting suggestions that allowed me to think more creatively about the project. Looking ahead to future projects, I hope to take on more design-related challenges, even though I am not entirely confident in my abilities. Why 1[I don't want to do more things in MakeSpace because I think I don't have the ability to do this now]. Why 2[I think I'm lazy, so maybe I don't want to do more things than this]. Why 3[When I'm lazy, I don't try to improve my skills]. Why 4[I guess it's because I don't see immediate benefits or results from putting in the extra effort. Why 5[I just get discouraged easily if I don't see progress quickly, and then I lose interest]. Why 6[I'm used to getting results quickly in other areas of my life, so when things take longer, I get frustrated]. I am currently not very interested in Makerspace because I don't feel I have the skills to make full

FINDINGS CONTINUED

IN A GIST

The findings highlight student challenges in the maker space, including tool unfamiliarity and the need for better support.

Visualize the distribution of the student population (derivative of the rainbow sheet)

	A	B	C	D	E	F	G	H	I	J	K	L
1												
2	Survey URL https://docs.google.com	P1#	P2*	P3#	P4*(I2)	P5#	P6#	P7#	P8#	P9*	P10* (I1)	P11*
3	High or low year student	L	H	L	L	H	H	H	L	H	L	H
4	Experience(Lab)	0	0	1	0	1	1	1	1	0	0	0
5	Comfort Level	0	0	0	0	1	1	1	1	0	0	0
6	Familiarity with ICCIT Space	0	0	1	1	0	1	0	1	0	0	0
7	Perception of Lab Convenience	0	0	1	0	1	1	1	1	0	0	0
8	Perception of Lab Accessibility	0	1	1	0	1	1	1	1	0	0	0
9	Ease of Learning and Navigation	1	0	1	0	1	1	0	1	1	0	1
10	Easy to follow tut	1	1	1	0	1	1	0	1	1	1	1
11	Beneficial for learning	1	0	1	0	1	1	0	0	1	0	0
12	Feeling overwhelmed	1	0	1	0	1	0	1	0	0	0	0
13	Preference over classroom	1	0	1	0	1	1	0	1	1	1	1
14	Independence after instruction	1	0	1	0	1	1	0	1	1	0	0
15	Innovation	1	1	1	1	0	1	1	1	1	1	1
16		58.33%	25.00%	91.67%	16.67%	83.33%	91.67%	50.00%	83.33%	50.00%	25.00%	33.33%
17												

FIGURE 3

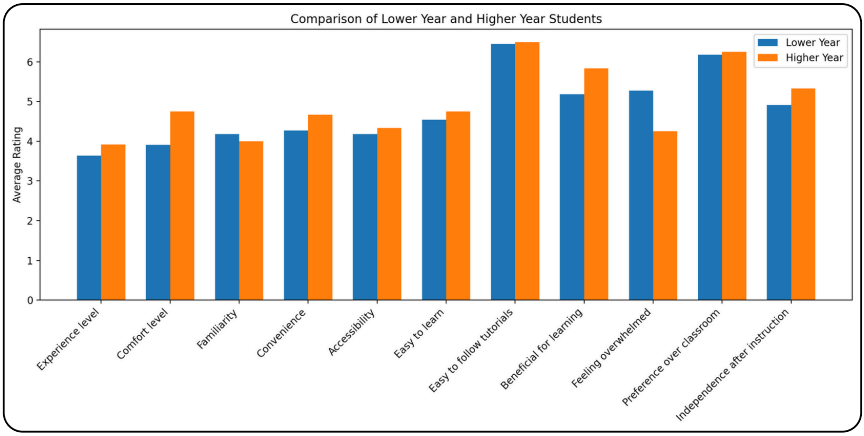


FIGURE 4

Affinity Diagramming

Section 1

Access Issues

I feel like the maker space has good ways for students to create and use its facilities, but it would be better if more accessible.

It's cool but not knowing how to use anything in the space kind of defeats its purpose.

It's inconvenient to get access to the space. I don't even know whether or not I can go in and use the stuff inside, or how to sign up to use it and when.

Confused about how we can use it.

More descriptions of who made it and what it is would help me understand the students' work.

Collaborating

The culture feels collaborative if you are able to find people to help you do your tasks, but without this support, it's hard to interact with the space.

The makerspace is decent for group work and allows the TAs to be supportive.

Collaborative: the open spaces, the tabling, and the numerous machinery welcome collaboration among students.

The space supports collaboration, but it can feel overwhelming as a beginner.

It supports collaboration but is not very stimulating creatively.

Innovative

Futuristic. Lab-like.

High tech.

"Innovative.

The first thing I feel is this space is cool because there are lots of machines I never saw before.

Learning Curve

The first thing I feel is this space is cool because there are lots of machines I never saw before.

The environment is a little confusing and not intuitive to understand at first.

I need more guidance to help me learn the tools, even after the TAs' step-by-step instructions.

I think the space is very fitting for people who are familiar with the technology or have some prior knowledge, but it's overwhelming for beginners.

The room is difficult to navigate as a beginner. Not sure where machines are located or how to use them.

Although TA showed us how to do things, I still need more guidance to help me learn.

I feel slightly experienced with the maker spaces after the first couple of tutorials but could use more knowledge.

It's cool but not knowing how to use anything in the space kind of defeats its purpose.

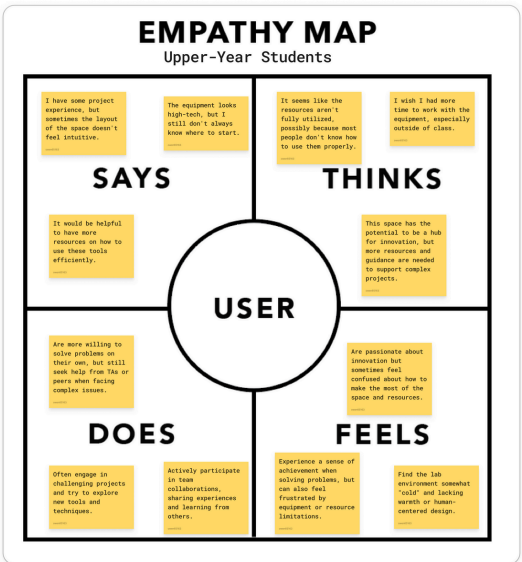
My feelings are mixed and confusing at first, but I feel more relaxed after further instructions

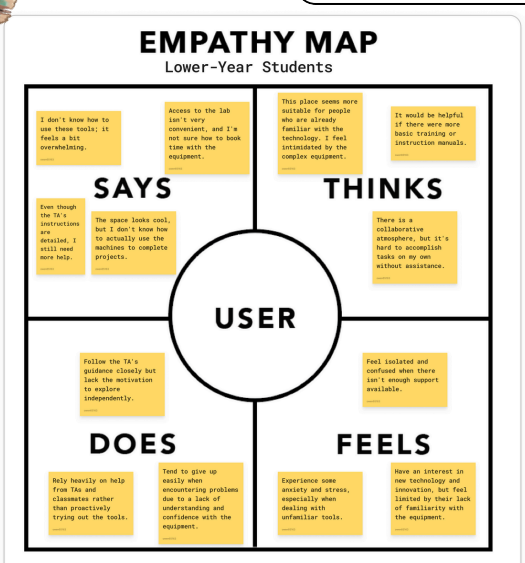
Negative Atmosphere

Because of the late lab times, it feels like a chore.

The makerspace feels overall very messy as there are various sections all in one room.

It does not give a feeling of a collaborative or creative area of a makerspace. It is grey and the machines are not easy to spot.


EMPATHY MAP
Upper-Year Students
SAYS
I have some project experience, but sometimes the layout of the space doesn't feel intuitive.
The equipment looks high-tech, but I still don't always know where to start.
It would be helpful to have more resources on how to use these tools efficiently.
THINKS
It seems like the resources aren't fully utilized, possibly because most people don't know how to use them properly.
I wish I had more time to work with the equipment, especially outside of class.
This space has the potential to be a hub for innovation, but more resources and guidance are needed to support complex projects.
USER
DOES
Are more willing to solve problems on their own, but still seek help from TAs or peers when facing complex issues.
Often engage in challenging projects and try to explore new tools and techniques.
Actively participate in team collaborations, sharing experiences and learning from others.
FEELS
Are passionate about innovation but sometimes feel confused about how to make the most of the space and resources.
Experience a sense of achievement when solving problems, but can also feel frustrated by equipment or resource limitations.
Find the lab environment somewhat "cold" and lacking warmth or human-centered design.


EMPATHY MAP
Lower-Year Students
SAYS
I don't know how to use these tools; it feels a bit overwhelming.
Access to the lab isn't very convenient, and I'm not sure how to book time with the equipment.
Even though the TA's instructions are detailed, I still need more help.
The space looks cool, but I don't know how to actually use the machines to complete projects.
THINKS
This place seems more suitable for people who are already familiar with the technology. I feel intimidated by the complex equipment.
It would be helpful if there were more basic training or instruction manuals.
There is a collaborative atmosphere, but it's hard to accomplish tasks on my own without assistance.
USER
DOES
Follow the TA's guidance closely but lack the motivation to explore independently.
Rely heavily on help from TAs and classmates rather than proactively trying out the tools.
Tend to give up easily when encountering problems due to a lack of understanding and confidence with the equipment.
FEELS
Feel isolated and confused when there isn't enough support available.
Experience some anxiety and stress, especially when dealing with unfamiliar tools.
Have an interest in new technology and innovation, but feel limited by their lack of familiarity with the equipment.

NEEDS? USER GROUP!

Emily Zhang

personas

Age: 19

Year: First or second year student

Major: CCIT program

Location: Canada

"Step by step, I'll get there."

Bio

Emily, a 19-year-old first-year CCIT student, is passionate about creative arts but has limited experience with technology. She felt overwhelmed when she first entered the maker space, finding the tools unfamiliar and the environment intimidating. While she enjoys group projects and benefits from TA guidance, she struggles with working independently. Emily wants to build her confidence using lab equipment and actively participate in future projects.

Needs and Goals:

- Starting with the basics to understand lab tools and equipment better.
- Participating in projects that blend creativity and technology to enhance skills and portfolio.
- Making friends and collaborating on projects.

Behavior Pattern

1. Seeks help frequently from others.
2. Uses tools mainly with supervision.
3. Visits infrequently due to barriers.

Motivations

1. Improving technical skills.
2. Valuing collaborative experiences.
3. Driven by completing projects.

Pain Points

1. Confusing Layout
2. Intimidating Tools
3. Limited Access
4. Guidance Reliant

Taylor Azakiaku

personas

Age: 22

Year: Third or Fourth year student

Major: CCIT program

Location: Canada

"Innovation starts with taking risks."

Bio

Taylor, a 22-year-old fourth-year CCIT student, discovered his love for making during his second year. With experience in digital fabrication, he feels comfortable with some tools but still encounters challenges with certain equipment. He aims to maximize the lab's resources despite time constraints and shared space limitations. Passionate about innovation, Taylor wants to create a strong portfolio for a career in creative technology.

Needs and Goals:

- Advanced training for efficient tool use.
- Creating complex, boundary-pushing projects.
- Building a portfolio showcasing technical and creative skills.
- Contributing to the maker community through knowledge-sharing and collaboration.

Behavior Pattern

1. Troubleshoots problems independently before seeking help.
2. Actively participates in projects beyond class requirements.
3. Enjoys sharing knowledge and collaborating on complex projects.

Motivations

- Creating unique and innovative projects.
- Continually improving and mastering new skills.
- Gaining recognition for technical and creative achievements.

Pain Points

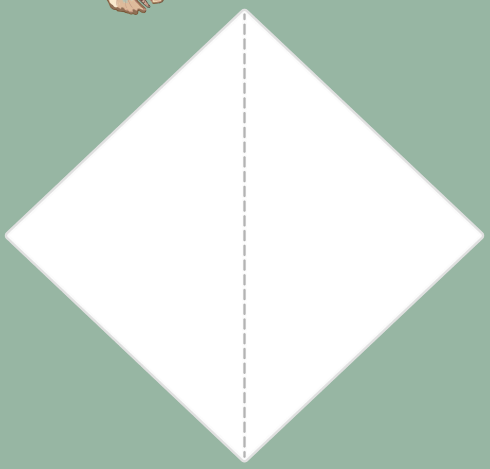
1. Struggles to maximize lab resources.
2. Lab hours often conflict with personal schedule.
3. Space feels restrictive during busy times.
4. Needs specialized training or expert guidance.

REAL PROBLUM

"HOW MIGHT WE REDESIGN THE ICCIT MAKER SPACE FRAMEWORK BY IMPLEMENTING AN INTEGRATED SUPPORT TOOL TO EMPOWER LOWER-YEAR AND UPPER-YEAR STUDENTS TO ACHIEVE GREATER CONFIDENCE IN TOOL USAGE AND MAXIMIZE RESOURCE UTILIZATION FOR INNOVATIVE PROJECTS?"

SECTION 4

Design Thinking Process



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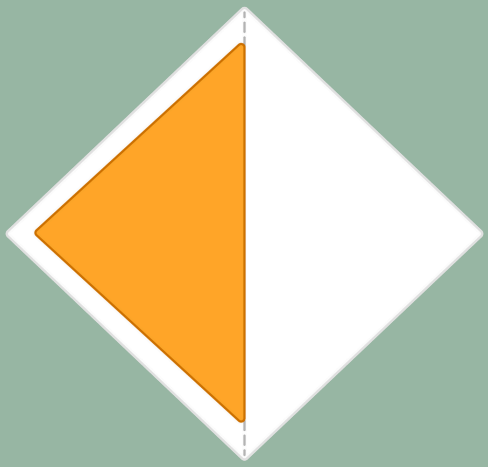

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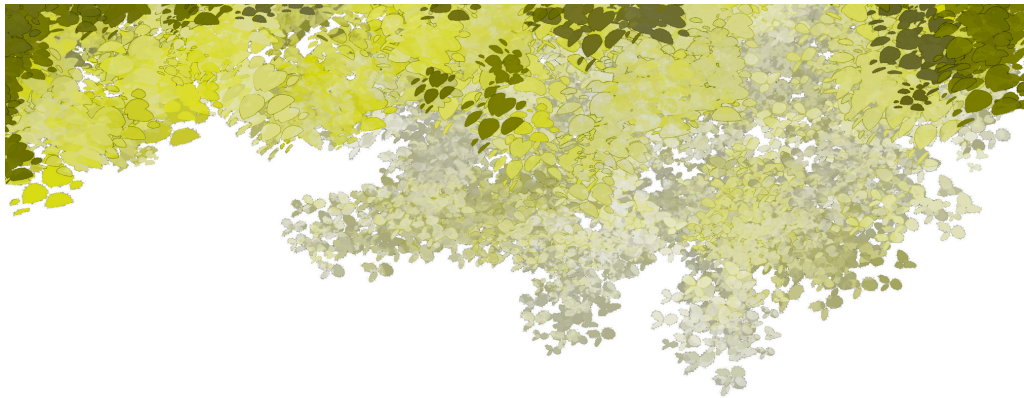


SECTION 4

PROTOTYPE

IDEATING A SOLUTION - ADDRESSING A PROBLEM DEFINITION

IN A GIST

The ICCIT maker space needs a support framework to improve engagement, access, and creativity.

Problem Statement

To address the issues that students of varying levels face in ICCIT's maker space, a structured and supportive ecosystem must overcome "resource under-utilization" and low "student engagement."

Younger students **(Personas 1)** find themselves overwhelmed by the technical complexity of the tools and struggle with abstract conceptualization, compounded by a lack of foundational training to operate the equipment independently. In contrast, older students **(Personas 2)** are hindered by time limitations and face challenges accessing and sharing advanced resources within the maker space.

A practical solution involves developing an integrated support framework around the maker space concept, which incorporates efficient training programs, flexible lab hours, expert mentoring, and a collaborative community for the exchange of knowledge.

This framework will foster an inclusive and supportive environment where students of all levels can confidently utilize tools and resources, promoting creative project development, and a more enriched learning experience.

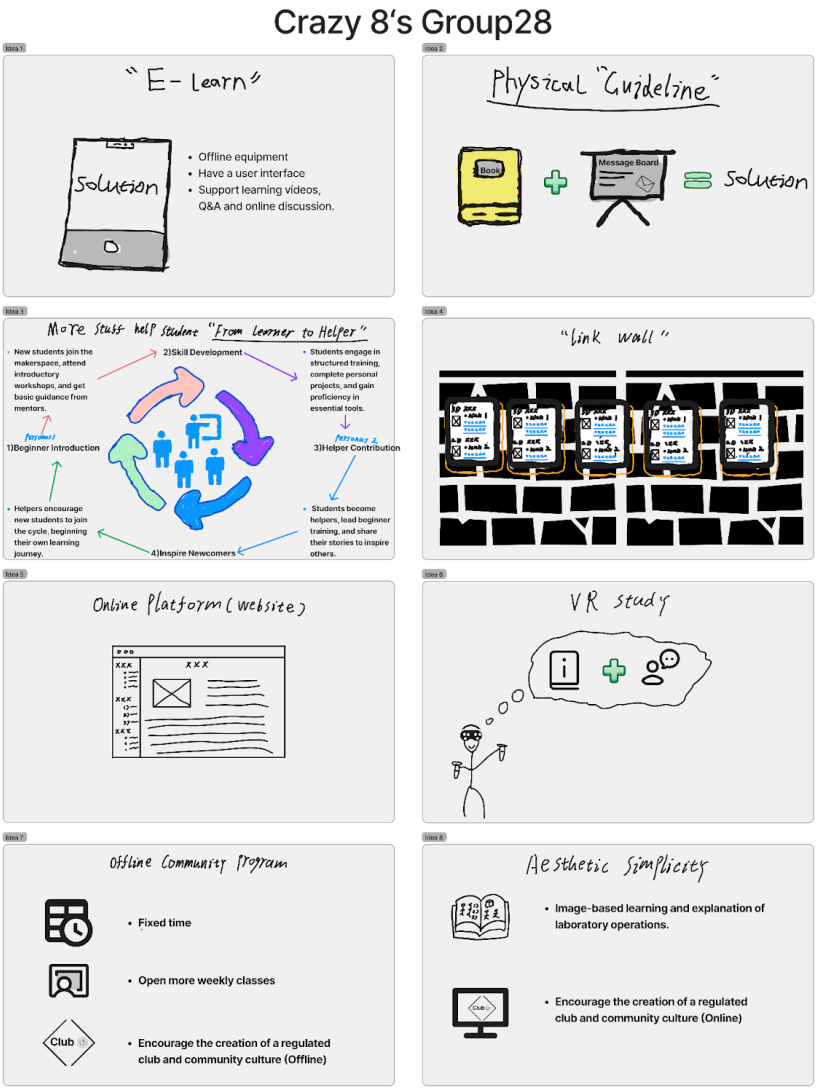
In summary, implementing such a system will ensure that the ICCIT maker space is fully optimized and accessible, enhancing resource efficiency and student engagement.

IDEATION

IN A GIST

The findings highlight student challenges in the maker space, including tool unfamiliarity and the need for better support.

In order to ideate an effective solution, the crazy 8 brainstorming technique was utilized in order to form and organize a wide array of ideas and possible concepts.



The findings highlight student challenges in the maker space, including tool unfamiliarity and the need for better support.

SAPLING

Fusion of Ideas

In the "Find the Right Solution" stage of the Double Diamond model, Norman (2013, p. 220) outlines a path from divergent ideation methods—such as Crazy 8's—to the user testing phase.

This process involves synthesizing multiple design concepts into a refined, cohesive prototype. Our primary inspiration came from Idea 6, where we explored a fundamental question with our user community (Five Why) : **"How can students grasp and internalize the content before interacting with the physical lab?"**

Guided by this inquiry and the consideration of advanced resource-sharing needs for an additional user group, we merged the strengths of e-learning (Idea 1) with the timely feedback capabilities seen in Idea 5.

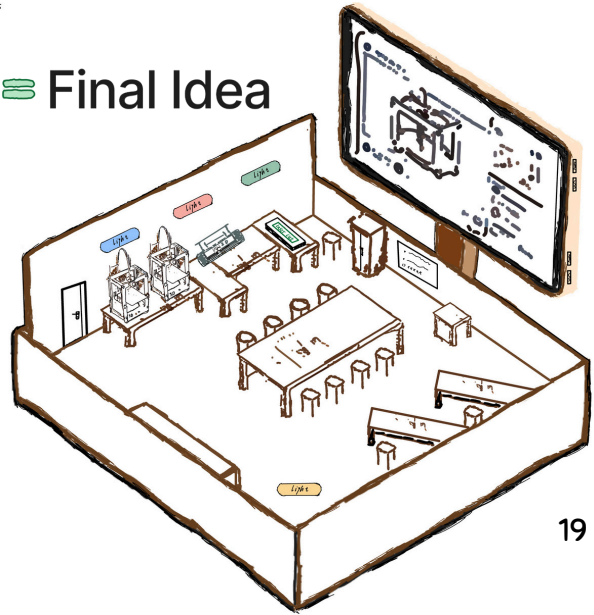
One significant challenge involved balancing Idea 8 against Idea 2, as we intended to test user responsiveness to varied interface structures.

To address this, we opted for A/B testing, drawing on Norman's (2013), "Table 3.1 framework on trade-offs between knowledge in the world and knowledge in the head." We aim to pinpoint the most balanced solution through user testing, optimizing usability and cognitive retention. Our final idea chose a physical user interface on a touch display. This interface provides general learning content, facilitating study, communication, and inquiry (see IA for details).

For interactions with virtual content on a digital platform, we integrated a "mini-lab" model (inspired by VR) to enhance engagement. Specifically, as users view digital content representing different lab locations, the corresponding area of the lab model illuminates to guide their focus.

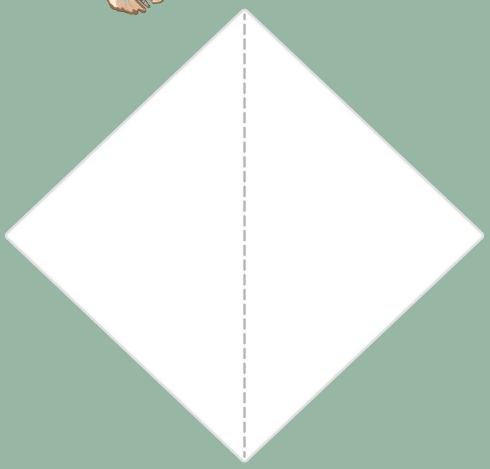
This feature aims to be user-friendly for the Personas 1 user community while providing visual clarity to Personas 2 as they navigate advanced resources, such as lighting indicators, when specific machines are reserved. Through this multifaceted approach, we aim to deliver a responsive and intuitive interacting experience that aligns with user needs across varied personas and use cases.

Idea 1 + Idea 5 + lead 6 + Idea 8 OR Idea 2 = Final Idea



SECTION 4

Design Thinking Process



RESEARCH

DESIGN

PROTOTYPING

IN A GIST

The prototyping stage focuses on developing and testing solutions to address the identified challenges, refining ideas through iteration to ensure effectiveness and usability in the maker space.

Prototyping included a complex process of both physical effort and digital design.

As such, the two major components were creating the physical model of the maker space and the UI touchscreen interface.

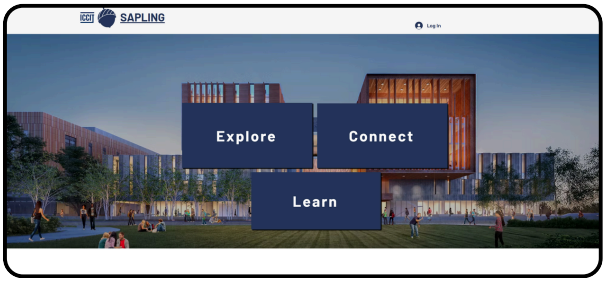
Together, these components create the product known as *'The Sapling Framework'*. Below are visuals of the design process.

The image on the right depicts the creation process for the live models and how each aspect and characterstic of the maker space was carefully crafted using recyclable component.

This is an image of the very first version of the Sapling Prototype.

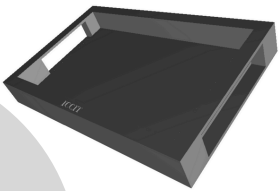
It includes the basic implementation of the touchscreen interface alongside the physical live model which depicts the makerspace.

In this version of Sapling, the LED lights are yet to be included and the UI interface was still in progress.



This image depicts an early conception of the Sapling UI.

This version is referred to as Sapling UI 0.1 or SUI 0.3

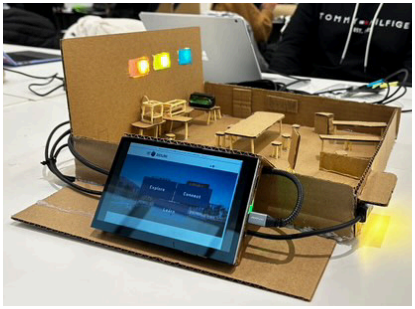


This was the 3D design render that was created using the Tinkercad software.

This 3D render essentially serves as a case to the Touchscreen UI Interface and makes sure all ports and wiring are secure and firmly in place.

SAPLING

The User Testing stage served as the main area for the user to interact and navigation The Sapling Framework firsthand.



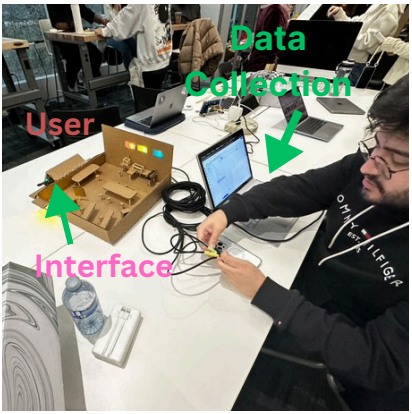
The best mapping is in the product itself (Norman, 2013, p.115). "Constraints" is the hierarchical relationship expressed in the prototype as a user interface (see IA for details). "Feedback" in the prototype is light and sound.

As such, user testing was conducted in a fashion where the user would interact with the Sapling Framework while they were monitored and recorded in order to see and view they behavior in terms of navigation.

The main objective of the user testing was to determine whether the prototype is "discoverable" and "understandable" from the perspective of design principles.

First, the Affordance of the prototype will be discussed separately from the mini-lab and the monitor interface. The "Affordance" provided by the mini-lab provides direct visibility of the relationship between people and architectural structures and Spaces.

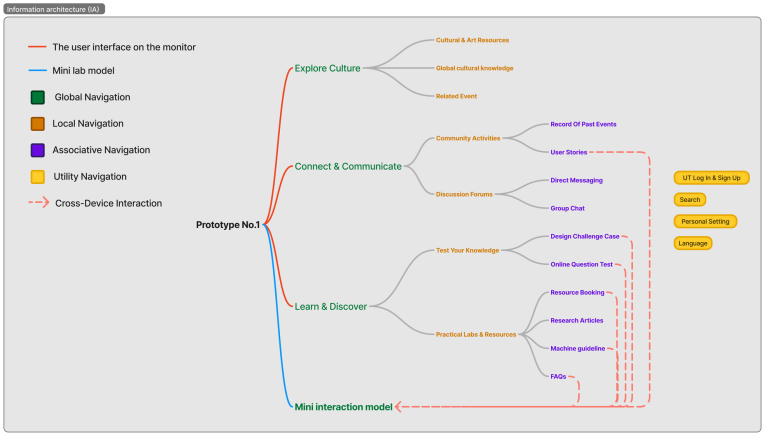
The Affordance of the monitor is clickable and interactive. The "Light" word on the prototype is a "Signifier," and users can easily find the lighting properties it brings when using the prototype. The prototype's embodiment of "Natural Mapping" is that when the user operates the relevant interface, the light on the mini model will be lit up accordingly.



This image depicts that very process of in-person user testing. The user would undergo navigation tasks then they were asked to post a tweet on the Sapling social media itself.

Information Architecture

Below is a basic understanding of the architecture that was user for user testing. This basically served as the backbone to navigation.



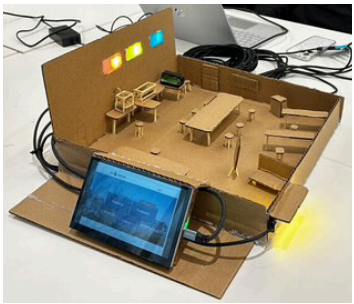
SAPLING

A demonstration of the final Sapling Framework

The final takes into consideration the main discrepancies that were present during user testing of the prototype.

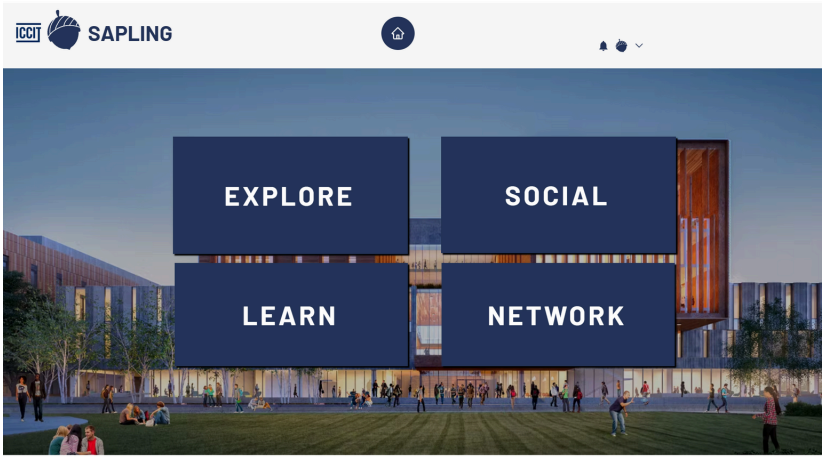
The main concern for the users was ease-of-use and the ability to easily interact with Sapling without prior instruction of any kind.

As such the final design made sure to implement a balanced mix of **Physical** and **Digital** design that did not conflict but rather complimented each other.

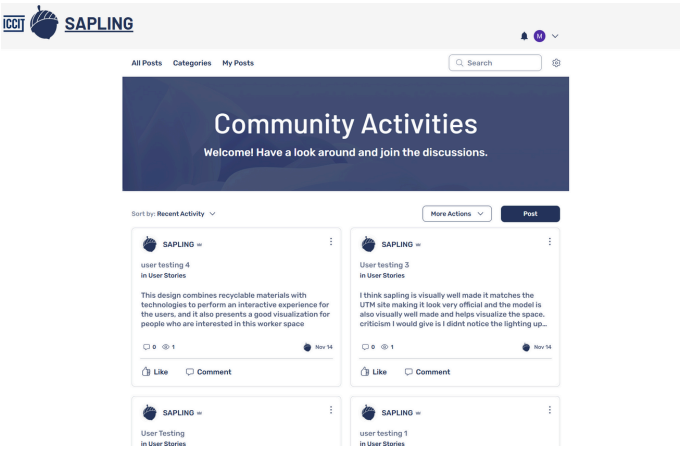


SUI 0.3

The primary changes that were made to increase user performance and address their needs was with Sapling UI. With that in mind, Sapling UI version 0.3 **(SUI 0.3)** was created as a quality-of-life update. This update includes major UI changes and adds major additions to the platform.



HOME PAGE

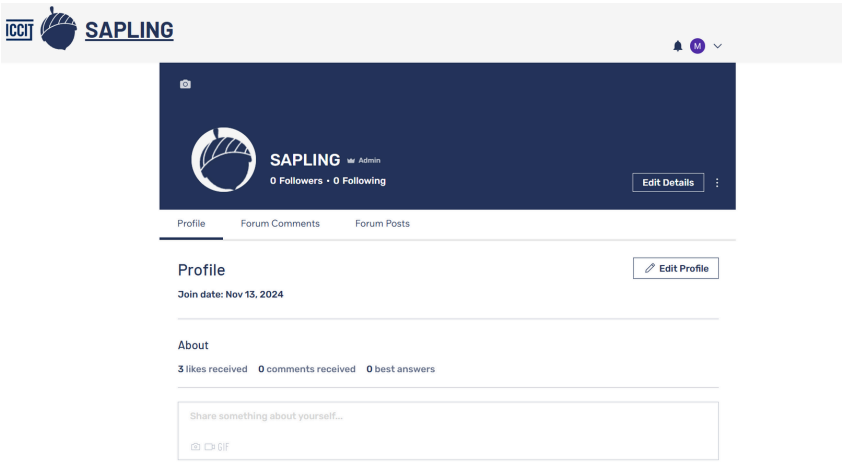


SOCIAL PAGE

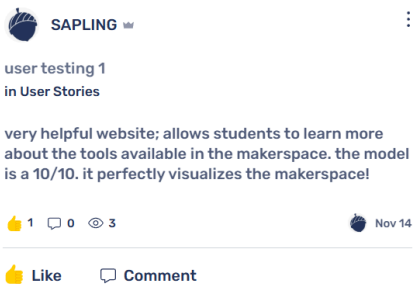
FINAL DESIGN

IN A GIST

A demonstration of the final Sapling Framework



PERSONAL PROFILE PAGE



SOME OF THE TWEETS THAT USERS POSTED USING THE SAPLING SOCIAL MEDIA

SAPLING

CRITICAL REFLECTION

Undergoing such a design process provided us with many valuable and long lasting insights in regards to the world of UX/UI, architecture, brainstorming, and the very core concepts of design. This project gave us an opportunity to deconstruct the world around us in a very thought provoking and specific manner. That is not to say that the project was in any means light in terms of the thought process needed to effectively navigate the various stages of design thinking. However, it challenged us to think beyond the immediate and often obvious meaning in things, and shifted our perspectives into viewing things that are not as implicit but require depth.

In terms of challenges and the main areas which puzzled us at times were in regard to interpreting the design challenge itself. In that process, deconstructing and identifying a problem was a challenge. If one were to take a simple look at the maker space or ICCIT in general, creating any sort of conviction would be a difficult task. In that sense, the research stage and user testing specifically really aided us in grasping and understanding the maker space as a concept and how brainstorming and storytelling can help identify a discrepancy in order to create a solution.

The key aspect in making the research successful was accomplished through the use of the online survey which was created through google forms. The survey allowed us to conduct a quantitative data collection in which we could apply logic and then identify active trends in opinion. It was something that could give us some sort of concrete idea.

On the other hand, we constantly utilized the open ability to conduct in-person qualitative interviews and discussions with users. This was a great aspect that enabled us to get immediate feedback and results in terms of finding issues for the eventual prototype and the initial research. This part of the research was actually how we got most of our feedback for the Sapling UI. Users were forward with their main issues and 'irks' with the Sapling UI. After we implemented the SUI 0.3 update which drastically improved the interface into a working social and learning system, we saw firsthand navigational improvements in terms of usability and as a concept.

The main factor we learned after the application of user testing was that the design of something should be understandable and as such; deconstructable. This means that an individual should be able to walk up to the Sapling Framework and be easily able to use it for the first time. As such, we feel that simplicity and ease-of-use is what makes Sapling stand out.

For the Sapling Framework, we wanted to implement a mix of digital and physical components. As physical could ground the student to the environment around them and the digital could connect Sapling to the internet which can allow access to the interface from every phone on campus. In that sense, both the student and faculty are always connected to Sapling, and as a result; the ICCIT maker space.

Sapling is convenient and serves a simple purpose. We believe that is the definition of a successful design.

Regards,

Muhammad Ibrahim Noorani

Hanwen Zhang

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Appendix

https://docs.google.com/document/d/1OKjK7cfhd8FSgQVJr-eQI-fk_TdUcaw4b1TdELgiYdI/edit?usp=sharing