

# EVALUATION AND FINAL PROJECT

## CREATING A SIMPLE AND INTUITIVE FILE CONVERSION INTERFACE

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### ABSTRACT

Sharing files in different formats is a common task, but many file conversion tools are too complicated and frustrating for users. This paper introduces a simple, user-friendly file conversion tool designed to make the process easier. Based on interviews with 20 users, we found that many struggle with avoidable development and design issues when transferring files between devices; for example, confusing menus. Our tool aims to solve these problems with a clear interface that guides users through conversions quickly and without mistakes, improving productivity for anyone who needs to convert files regularly.

Our usability testing of two designs implementing a file conversion tool demonstrated that a simplistic and limited design option served better a greater number of users than an info-packed and dense design.

### CCS CONCEPTS

Human-centered computing → Human computer interaction (HCI) → HCI design and evaluation methods

### KEYWORDS

User interface, file extension, file conversion tool, file sharing

## 1 INTRODUCTION

In today's world where every aspect of daily life is becoming increasingly digitized, complicated interfaces often get in the

way of completing simple tasks. File sharing is an increasingly common, and often mandatory, part of personal and professional communication. However, users encounter roadblocks with the abundance of file formats and how to convert between them for individual circumstances. This problem affects people across all backgrounds as many corporations and daily processes are being moved online, sharing documents of the appropriate format is a vital part to ensure the successful completion of these tasks.

Efficient and streamlined file sharing is essential for productivity, collaboration, and communication. This is hindered when users face complicated tools or unclear instructions as it can lead to frustration, delays, and mistakes. Inability to communicate can also affect more than just individual users. Teams and organizations that rely on timely information and file exchange can be impacted as well. Designing a simple, intuitive interface solution will save both time and effort, which allows users to focus on the tasks they are trying to complete and not on learning file conversion methods.

The ideal end-users of our application are any individuals who frequently communicate through technological means. The users of these systems span across almost every demographic, including students, educators, office workers, photographers, and other casual users who need a simple, straightforward way to convert files without being overwhelmed by confusing instructions or an overabundance of options.

Our goal is to solve this problem by creating an intuitive and simple file type conversion tool that gets rid of any unnecessary complexities. The program we propose will

feature a concise, clean, user-friendly interface that guides users through the entire process step by step. It will also ensure that the user can easily convert files without any confusion. By implementing a design that focuses on these qualities, we hope to create a solution that allows daily users to perform essential file conversion tasks confidently and efficiently.

In our user studies, we are evaluating the efficiency and usability of our newly implemented tool in comparison to the previous version. Specifically, we aim to measure the time users take to complete a set of predefined tasks and gather qualitative feedback on their experience with the tool. The study focuses on both novice and experienced users to capture a broad spectrum of use cases.

### Primary Evaluation Metrics:

- **Task Completion Time:** Measuring the duration for each task to determine whether the tool provides time savings.
- **Consistency of Performance:** Analyzing variations in task completion times to assess whether the tool supports predictable and repeatable performance.
- **Ease of Repeated Use:** Observing user performance during repetitive tasks to understand if the design facilitates familiarity and efficiency over time.

### Secondary Evaluation Metrics:

- **User Feedback:** Collecting insights on perceived intuitiveness, ease of use, and satisfaction with the workflow.

### Hypothesis:

1. **Primary Hypothesis:** Our implementation of a file conversion program will yield net time savings as compared to the current implementation.
2. **Secondary Hypothesis:** Our implementation of the file conversion program grants greater user satisfaction than the current implementation.

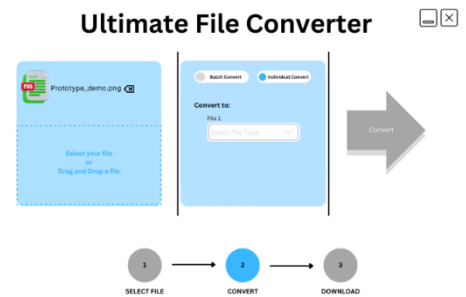
## 2 DESIGNS

Our initial design focused on implementing core features of a file conversion system with a limited user interface that forced users to focus on one step at a time. The prototype design included three major steps:

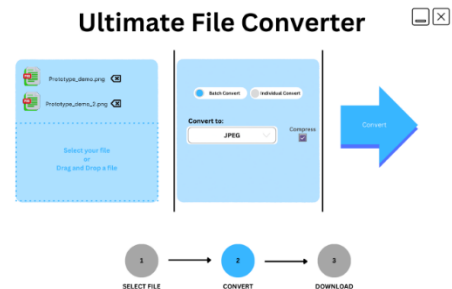
1. Upload file for conversion. The file could be dragged & dropped or selected from the file directory.

2. Configure conversion parameters. This section will change depending on the number of files the user has uploaded. Here, the user will decide file formats and any additional settings.

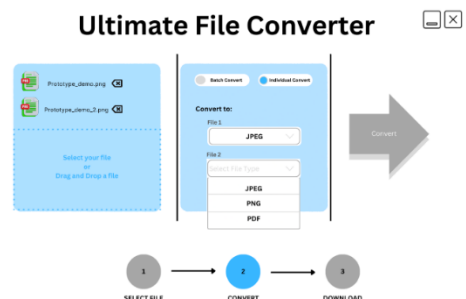
The options for a single file are rather limited, only allowing selection for the file type it is converting to, and once that is selected the convert arrow becomes available to interact with.



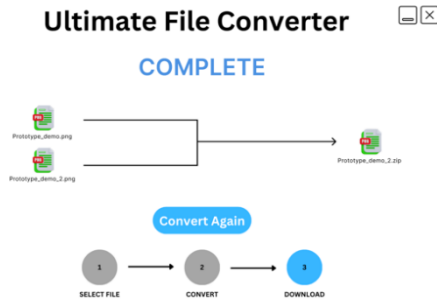
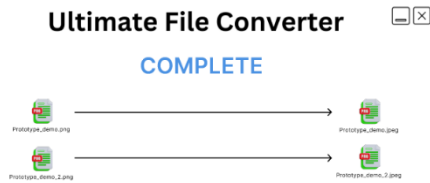
For multiple files, new options are available for the user. The user can select the option “Batch Convert” which consolidates selected files into one output file. Additionally, they may choose to compress the output file for a smaller file size.



Alternatively, the user can also select “Individual Convert,” which will create the same number of output files as there are input files. Each file conversion result must be selected for the number of input files. Then, the convert button will be available.



3. The file(s) become available to download. The final page will be different depending on user selections.



Each step was additionally denoted by a step progress bar at the bottom of the application. The prototype used blue as the accent color and white as background color. Additionally, we used the accent color or iconography whenever possible to denote actions such as removing files from the process or a next step button once an actionable step becomes available.

After presenting the design, we were given several feedback for what our design did well and areas for improvement. Summarizing the critiques and where our design succeeded, we found that:

- File conversion was a common activity
- Our design focus on differentiating steps offered clear informative feedback
- The simplistic/limited design is straightforward in terms of usage

Additionally, there were some conflicting suggestions, some saying that interactive elements were not large enough or too crowded, and some said that the interactive elements wasted too much space and could be condensed to a lower number of screens or steps.

We decided to home in on these issues by establishing overall goals to improve on:

1. Design elements such as readability, user interactions, and animations
2. Improve efficiency compared to existing solutions
3. Differentiating our solution by providing unique features

We established three categories for possible features and changes to implement: design, efficiency, and specialty.

Design:

- Move step progress bar to the top
- Light/Dark themes
- Add tooltips/walkthroughs
- Increase readability of design (red accent color for remove file button)
- Add animations to increase fluidity

Efficiency:

- Add session history or a recent conversion (either shows where files were downloaded or allows for the user to download past conversions)
- Toggle auto-download
- Toggle preserve last conversion configuration
- Let users set a 'default' conversion format
- Allow quick conversions through drag and drop with configurations set up

Specialty:

- Add a way to share files
- Lock files
- Sort file order (when converting to .pdf)
- More file types -> Request file type button

We plan to implement these features prioritizing efficiency first, followed by specialty, and finally design.

### 3 IMPLEMENTATION DETAILS

#### System Functionality

Our system is a file type conversion tool designed to provide a simple and user-friendly experience. The primary functionality includes:

1. File Selection: Users can upload files of supported types directly via a drag-and-drop interface or a traditional file browser.
2. Format Selection: The tool automatically detects the uploaded file format and provides a list of compatible formats for conversion.
3. Conversion Process: Users select their desired target conversion type, either in individual conversion mode or in batch conversion mode for multiple files. They can then initiate the conversion process with a single click on the designated arrow, and the system processes the file in real-time. A progress bar and/or live animation is displayed per file to increase the visibility of the system's state at all times.
4. File Download: Upon completion, the converted file is made available for immediate download. An option for automatic download is available to be toggled on. As a download option, users will be

able to select whether they want a compressed (ZIP) file or to download each conversion individually.

5. Error Handling: The system gracefully handles cases related to unsupported file types and errors during the file conversion process. The system will also always have visible queues to alert the user when unexpected states have been reached.

## Technical Implementation

Our system is built using React.js, a JavaScript library for creating dynamic user interfaces. Below are the key components and technical details of the implementation:

1. Frontend Structure
  - HTML Files: Provides the basic structure for the application. It includes a container `<div>` where the React app is mounted.
  - CSS Files: Defines the styling for the interface, ensuring a clean and responsive design optimized for both desktop and mobile devices.
  - JavaScript Files: Contains the React components and logic for each page that is available on the web application.
2. Backend
  - File conversions are handled client-side using JavaScript-based libraries (e.g., FileSaver.js for downloads).
  - There is no backend, as all the code runs in memory and client-side, eliminating the need for a framework like Express.js
  - There will be no need for a database, as all the user-generated content will be produced with code that is locally downloaded and run. The selection options will be local files, so there will be no need to run a server to store any user data.

## Implementation Steps

- Step 1: Install React and related dependencies using node package manager (npm).
- Step 2 : Set up the project structure, including separate folders for components, assets, and styles.
- Step 3: Create individual React components for each part of the application, ensuring modular and reusable code.

- Step 4: Use React's state and props to temporarily store and manage state, data flow, and user interactions.
- Step 5: Integrate file conversion functionality, leveraging libraries or APIs for efficient processing.
- Step 6: Test the system extensively to ensure all possible user interactions lead to expected state and to handle edge-cases, like unknown file formats, illegal/unexpected user behavior, and unusual technical errors.

## 4 EVALUATIONS

### Population

Our target population will include users who frequently interact with file-sharing tools and have varying levels of expertise with technology. The participants will include college students, office workers, and casual users who convert between file formats. We will aim for at least 10 participants in our evaluation. The recruitment process will look for participants through word of mouth via family and friends.

### Hypotheses

Primary hypothesis: Our implementation of a file conversion program will yield net time savings as compared to the current implementation.

- NULL hypothesis: Our implementation of a file conversion program will NOT yield net time savings as compared to current implementations.

Further breaking down this hypothesis, the net time savings will be composed of time taken to complete common tasks with file converters:

1. Time it takes for users to convert one file.
2. Time it takes for users to convert another file after having completed their first conversion.
3. Time it takes for users to complete batch file conversion, converting multiple files at once.

Secondary hypothesis: Our implementation of the file conversion program grants greater user satisfaction than the current implementation.

- NULL hypothesis: Our implementation of the file conversion program DOES NOT grant greater user satisfaction than current implementations.

### Method

Participant procedure: We will use within-subjects design. First, we will begin with a pre-study interview. Then, our

study will randomly assign an “A design” and a “B design” first for each user. This will serve as counterbalance to ensure the order of the design does not cause one to be favored over the other. The designs will be either our implementation or a current implementation online.

Existing design: For the existing design we chose the website: <https://image.online-convert.com/convert> for comparison.

Participants will interact with both systems. Next, participants will be given tasks to complete. The task will include converting one file, converting multiple files, and converting multiple files sequentially. Using stopwatches (phone clock app) we will time the tasks. After completion, we will interview the participant with some questions.

Equipment:

- A device to interact with both systems (laptop, phone, etc.)
- Stopwatch timer (laptop, phone, etc.)

Location: A quiet room/environment

Time: ~30 minutes per participant, including introductions, study details, consent, instructions, tasks, and feedback.

## Metrics

Pre-study questions for the participant:

- Gender
- Age
- Highest form of education
- On a scale of 1 (completely unfamiliar) to 7 (very experienced), how would you rate your familiarity with modern technology (i.e. using a phone for reasons other than for calling, using a computer to browse the internet, using a computer for work).
- How often do you use file conversion tools? (daily, weekly, monthly, rarely, never).
- What tools or platforms have you used for file conversions?
- Were there any challenges with file conversions you have encountered? If yes, could you describe them?

Post-study questions:

- On a scale of 1 (very unsatisfactory) to 7 (very satisfactory) how would you rate design A?
- On a scale of 1 (very unsatisfactory) to 7 (very satisfactory) how would you rate design B?
- Was there at any point during the tasks that you were unsure of the next step? Could you pinpoint those moments?

- How easy or difficult was it to complete the single-file conversion task? Why?
- How easy or difficult was it to complete the multi-file conversion task? Why?
- How easy is or difficult was it to complete multiple file conversions in sequence? Why?
- Which system did you feel was faster to use? Why?
- Which system did you prefer to use? Why?
- Were there any features in either system that stood out to you?

Primary metrics:

- Time taken for new users to complete a file conversion with our design.
- Time taken for new users to complete a file conversion with existing design.
- Time taken for users to complete a subsequent file conversion with our design.
- Time taken for users to complete a subsequent file conversion with existing design.
- Time taken for users to complete multi-file conversions (converting multiple files at once) for our design.
- Time taken for users to complete multi-file conversions (converting multiple files at once) for existing design.

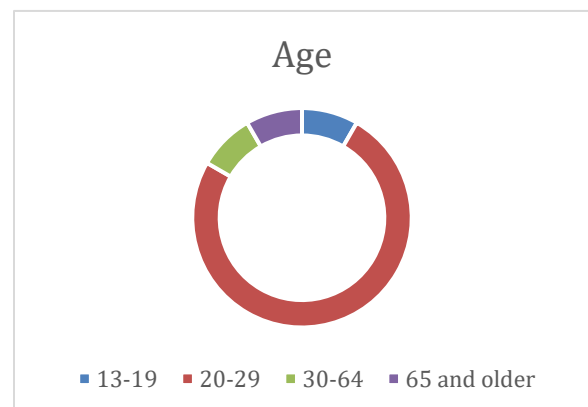
Secondary metrics:

- Compare users who were satisfied with either design through post study questions.

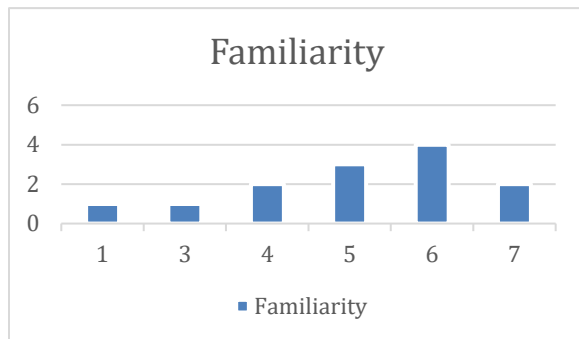
## Participants

We recruited our participants through family and friends. There was a total of 13 participants.

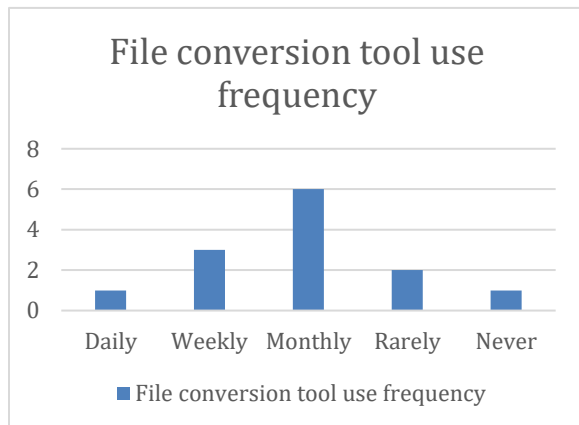
Demographic Information: Our participants were composed of 8 males and 5 females, with the majority being in the 20-29 age bracket. This is because most of our participant recruitment were friends or classmates that were around our age.



Our participants rated their familiarity with technology a mean of 5 with a standard deviation of 1.617 on a 1-7 Likert scale. 1 being completely unfamiliar and 7 being completely familiar with technology.



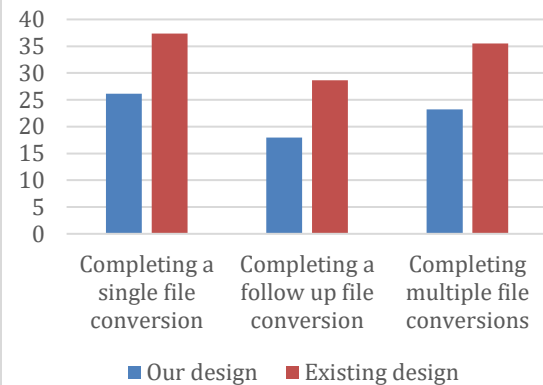
When asked how often they used conversion tools, most of our users said “Monthly” at 6 participants.



## Results

**Tasks:** We assigned a total of six tasks for participants to complete. They were timed on completing one file conversion with both designs, followed by a subsequent file conversion with both designs, and finally, converting multiple files at once with both designs.

### Our implementation vs existing implementation mean time to complete tasks



We measured participants the time it took for them to complete the tasks assigned and the graph above shows the average time it took for them to complete said tasks.

We wanted to observe the difference it takes for users to complete one file conversion with both designs and see the difference in time. This encompasses task 1 and task 2.

From task 1 and task 2 (APPENDIX TABLE 1), we have a mean of 11.23 seconds improvement in time, which demonstrated an overall faster time taken to complete a file conversion with our design. However, our standard deviation is 13.41 seconds, showing a great difference between users interacting with both systems. Some users were faster with the existing design rather than our implementation.

The next pair of tasks measured how long it would take for the user to navigate the interface to convert another file from the results page of the first two tasks.

For task 3 and task 4 (APPENDIX TABLE 2), we have a mean of 10.73 seconds improvement in time, which demonstrated an overall faster time taken to complete a subsequent file conversion with our design. The standard deviation is 9.46 seconds, with no users completing the task faster with the existing design.

The final tasks we asked participants to complete, task 5 and task 6, involved using our design and the existing design to complete a batch file conversion (converting multiple files at once).

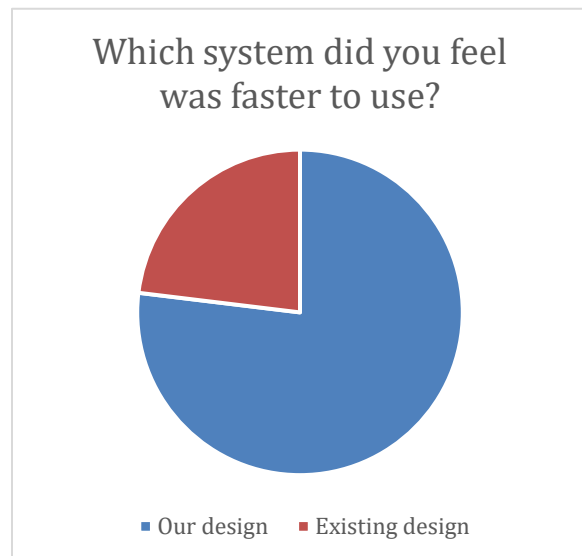
For task 5 and task 6 (APPENDIX TABLE 3), we had an improvement in time to complete the task with a mean of 12.34 seconds and the standard deviation of 14.65 seconds.

While there were some participants that were able to complete the task with the existing design faster, many participants were able to complete the task faster with our implementation.

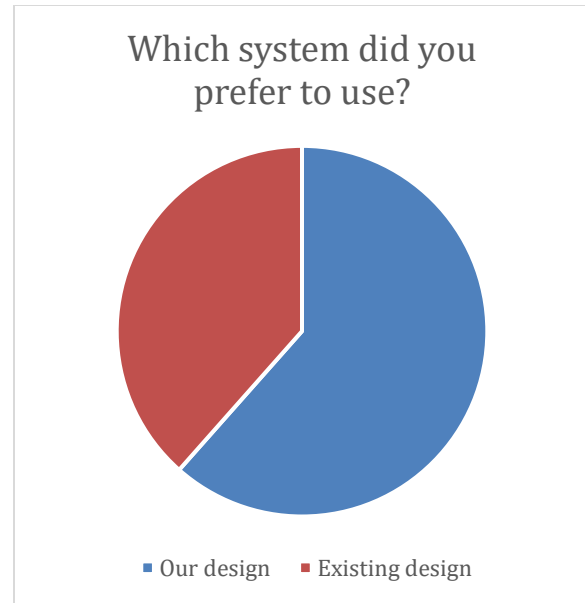
After having completed the tasks, we asked users for feedback on their experience with both file converters.

We asked participants to rate both designs on a Likert scale for satisfaction with the implementation. We found a mean score of 5 on the Likert scale for satisfaction with our implementation. For the existing implementation, we found a mean score of 4.84 on the Likert scale. Participants rated our design higher in terms of satisfaction.

Furthermore, we found that users felt our system was faster than the existing design. Out of the 13 participants, 10 believed our implementation was faster. Keywords for this question, when asked to elaborate, include “simple,” “cluttered,” and “overloaded”.



When prompted about which system they preferred to use, 8 participants preferred our implementation, and 5 participants preferred the existing implementation. Keywords when asked this question included “features,” “cluttered,” and “selection.”



## 5 DISCUSSIONS

### Primary Hypothesis:

The results indicate that our implementation yielded net time savings across all tasks. On average, participants completed tasks more quickly with our design, demonstrating that the streamlined workflow and interface changes effectively reduced task completion time. However, the high standard deviation, especially in tasks 1, 2, 5, and 6, highlights variability in user performance. This suggests that while the tool can save time, its success depends on user familiarity or skill.

Designers and developers should prioritize user onboarding and training to minimize this variability. Iterative testing might also help refine areas where some users struggle, ensuring broader usability improvements.

### Secondary Hypothesis:

The consistent improvement in task completion time without any users being slower in tasks 3 and 4 supports the idea that our design provides a more intuitive and satisfying experience for subsequent conversions. Faster navigation from the results page indicates that users found our interface more efficient and user-friendly for repeated tasks. Furthermore, the majority of participants felt that our design was faster and preferred to use our design over the existing design.

However, a couple of participants expressed interest in a wider range of feature sets or found the existing design better to use as it provided the user with a lot of information. These participants felt like “power users” that would appreciate a denser and info-packed design.

Developers should focus on optimizing repetitive actions and maintaining consistency across workflows, as these can significantly enhance user satisfaction. Streamlined, predictable design elements reduce cognitive load and create a more enjoyable user experience.

#### **Aspects that Worked as Anticipated:**

The implementation successfully improved task completion times across all tasks, as anticipated. Our design aimed to simplify navigation and reduce the steps required for file conversion proved effective.

Our results confirmed that our design was very efficient for subsequent file conversions (tasks 3 and 4) as it led to clear time savings. Our simple and intuitive design allowed users to easily complete subsequent file conversions.

#### **Aspects that Worked Differently than Anticipated:**

While we anticipated consistent time savings, the standard deviation for tasks 1, 2, 5, and 6 revealed significant differences in how users interacted with the two designs. Some participants were faster with the existing implementation, highlighting a steeper learning curve or potential usability issues in certain areas of our design.

## **6 CONCLUSION AND FUTURE WORK**

Our study demonstrated that our file conversion tool successfully reduced task completion times compared to the existing implementation. The observed time savings across all tasks, combined with positive user feedback on subsequent file conversions, suggest that our design effectively enhances efficiency and user satisfaction. However, variability in performance across participants highlights areas for further refinement to ensure consistent usability.

The batch conversion tasks revealed a need to better align our design with the advanced capabilities of current implementations. Addressing these gaps could enhance our tool's performance in more complex scenarios. Additionally, the high standard deviation in time savings suggests the importance of improving the intuitiveness of our interface, particularly for first-time users.

#### **Future Work:**

1. **Refinement of Batch Processing:** Investigate the specific aspects of batch conversion workflows that underperformed and implement features or optimizations to match or exceed existing system capabilities.
2. **User Onboarding and Training:** Develop and test tutorials, tooltips, or onboarding flows to address the learning curve for new users and reduce variability in task completion times.
3. **Expanded Testing with Diverse User Groups:** Conduct usability studies with a larger and more diverse user base to better understand how different user demographics and skill levels impact performance.
4. **Integration of Advanced Features:** Explore the addition of customization options, shortcuts, and other advanced features that cater to power users while maintaining simplicity for novice users.
5. **Ongoing Studies on User Satisfaction:** Evaluate how user satisfaction and efficiency evolve over time with prolonged use of our tool, ensuring sustained benefits and adoption.

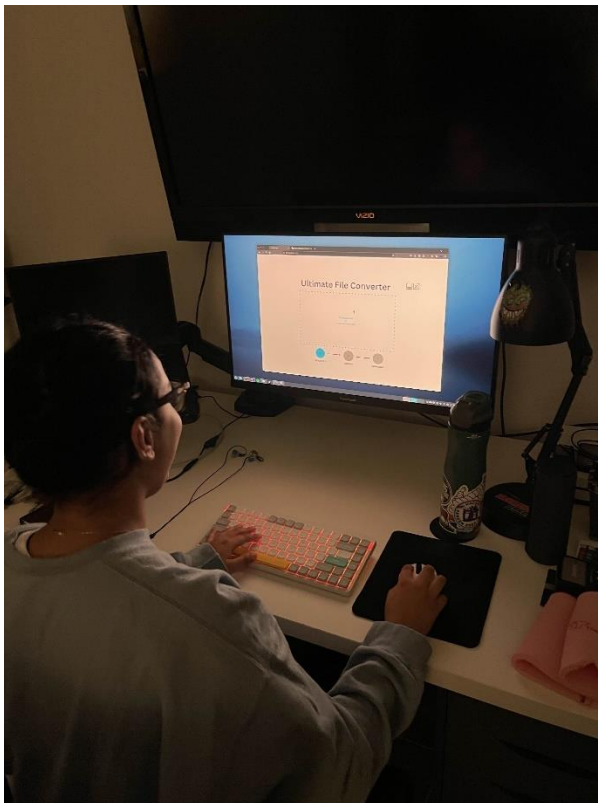


## APPENDIX

**IMAGE 1: PARTICIPANT IN STUDY**



**IMAGE 2: PARTICIPANT IN STUDY**



**TABLE 1 – TASK 1 & TASK 2**

Time taken to complete a file conversion with our design	Time taken to complete a file conversion with an existing design	Time improvement
36.7	54.7	18.0
17.0	23.0	6.0
26.1	48.3	22.2
14.0	10.0	-4.0
11.1	14.7	3.6
76.5	98.4	21.9
16.0	13.0	-3.0
19.0	26.0	7.0
4.0	10.0	6.0
30.0	60.0	30.0
24.7	44.8	20.1
24.9	57.0	32.1
39.9	26.1	-13.8

**TABLE 2 – TASK 3 & TASK 4**

Time taken for users to complete a subsequent file conversion with our design.	Time taken for users to complete a subsequent file conversion with existing design.	Time improvement
23.3	37.2	13.9
14.0	22.0	8.0
21.6	33.3	11.7
8.4	11.8	3.4
10.0	12.3	2.3
22.5	62.0	39.5
9.5	9.5	0

12.0	21.0	9.0
4.0	15.0	11.0
60.0	65.0	5.0
13.3	29.7	16.4
20.4	32.2	11.8
14.1	21.7	7.6

**TABLE 3 – TASK 5 & TASK 6**

Time taken for users to complete multiple file conversions at once using our design	Time taken for users to complete multiple file conversions at once using the existing design	Time improvement
34.4	44.5	10.1
17.0	54.0	37.0
31.2	41.8	10.6
16.6	9.1	-7.5
15.5	18.5	3.0
32.0	28.7	-3.3
15.4	24.0	8.6
38.0	82.0	44
4.0	15.0	11
34.0	60.0	26
19.7	16.6	-3.1
28.3	42.2	13.9
15.7	25.9	10.2

**TABLE 4 – USER SATISFACTION**

Satisfaction scale with our implementation	Satisfaction scale with existing implementation
6	2
4	5
6	3
5	6
4	3
7	7
5	5
7	7
5	6
5	6
2	4
5	3
4	6