Click, Scroll, Sigh: Fixing The Struggles of Scheduling on Carleton Central

Final Research Report

Human Computer Interaction (COMP 3008)

Carleton University

By

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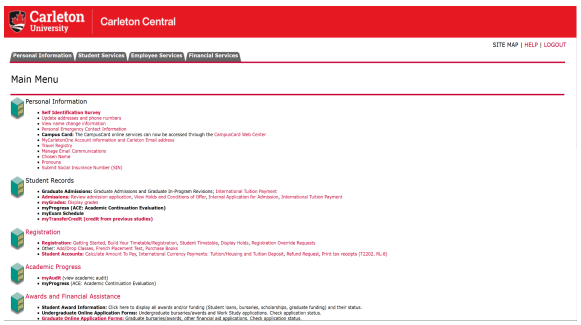
Abstract

This study evaluates the usability of Carleton Central's course scheduling system. A new redesign was proposed to address key issues such as poor affordance, ambiguous error feedback, and lack of adaptable features. A within-subjects experiment was conducted with six undergraduate students from Carleton University. Task performance was measured using completion time, error severity, and subjective workload via the NASA-TLX questionnaire. The results indicated a significant improvement with the redesigned interface. Participants completed tasks significantly faster and made no errors. Additionally, they reported experiencing lower cognitive load, reduced effort, and less frustration, while also expressing greater satisfaction with the interface. These findings suggest that the redesigned system offers a more efficient, intuitive, and user-friendly experience compared to the original.

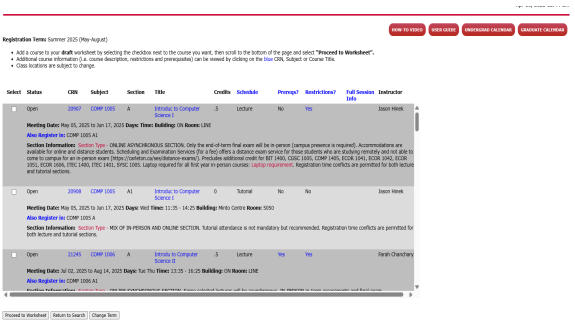
Introduction

Every Carleton University student dreads course selection week. A time that demands days of research and careful planning to choose the right courses for the upcoming semester. But why is this process so difficult? The answer lies in the issues within Carleton Central.

One major problem is that the user experience is the same for everyone, the system lacks adaptability. Each student faces the same static interface, which does not adjust to individual needs or preferences. Additionally, the poor interface design, as shown in (A), amplifies the issue. Users struggle with unclear affordances and lack of constraints, which guide them towards errors rather than helping them make decisions, as shown in (B). Many users are forced to rely on trial and error to find a schedule and navigate through the system, highlighting the need for an improved, more intuitive design.



(A) Image of Carleton Central homepage

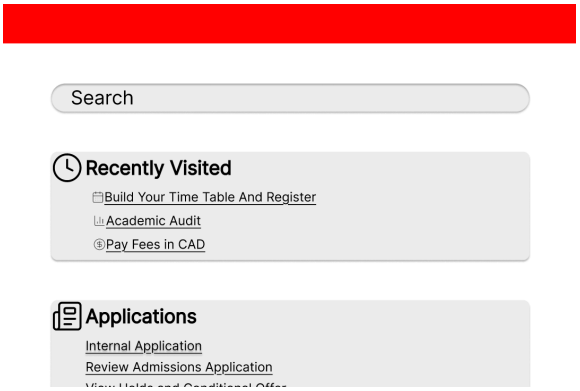


(B) Image of Course Selection Page

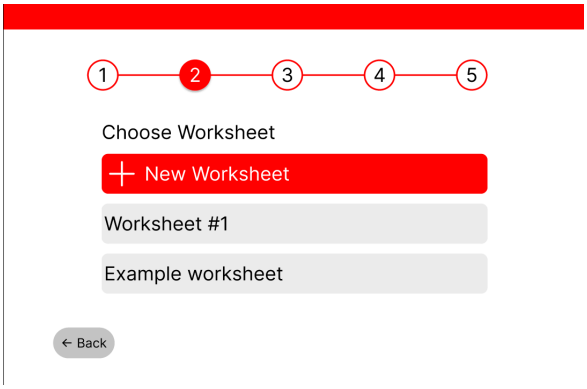
To address these issues, the design has been updated to provide more intuitive navigation, clearer steps, and labels that guide users through the course selection process, as seen in (C) and (D). The new interface simplifies the experience by making it easier to follow each step. Additionally, an auto scheduler has been introduced to recommend courses based on user preferences, helping automate the decision-making process and reduce the effort required. Furthermore, the system now highlights any errors or conflicts that might arise when adding courses to a schedule, providing real-time feedback that helps users avoid mistakes as seen in (E).

The goal of this study is to compare the original Carleton Central interface to the updated design to gauge whether the new design reduces task completion time, minimizes user frustration, and decreases the number of errors made while using the system. To determine the effectiveness of these changes, a usability study will be conducted using Figma mockups of the new design. Participants will complete scheduling tasks while their performance is measured in terms of task time, error rates, and subjective feedback through the NASA-TLX.

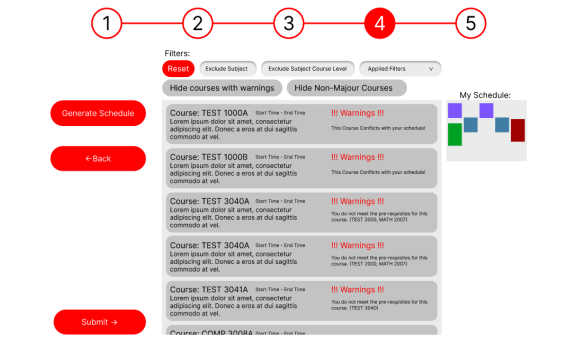
We hypothesize that participants using the updated interface will complete tasks faster, make fewer errors, and have a better experience compared to those using the original system. By comparing these results to the original system, we can assess whether the updated design successfully improves the user experience and supports more efficient, less frustrating course selection.



(C) Image of new home page



(D) Image of step 2 of new registration process



(E) Image of new Course Explorer Page, showing clear warning.

Methods

Participants

The participants chosen for this study were undergraduate students at Carleton University, between the ages of 18 and 25. All participants were required to be fluent in English and have no physical impairments that would affect their ability to use a laptop. To ensure familiarity with the task, participants also needed to have used Carleton Central at least once before for course scheduling. This criterion was set to minimize the learning curve during the study and allow for a more accurate assessment of the interface's usability.

Experiment setup

The experiment was conducted in a well-lit, quiet room at Carleton University, with minimal distractions to ensure participants could stay focused on the tasks. A privacy-style desk was provided for each participant to create a comfortable and neutral environment.

Each participant used their own laptop, ensuring they were already familiar with the device and eliminating the need for any device-related learning or adaptation. All laptops were required to be Windows 11 compatible, ensuring that system performance would not interfere with the user experience. Devices were configured to a 1920x1080 resolution and used a standard keyboard layout, and were connected to Carleton University's Wi-Fi to provide stable internet access. Participants used Google Chrome to access both Carleton Central and the Figma prototype. Participants were allowed to use either their built-in trackpad or a mouse, based on their personal preference.

An observer sat behind the participant to avoid influencing behavior through facial expressions or gestures. The observer only spoke at the beginning of the session, or in cases where the participant requested help or when an unexpected event occurred, to prevent influencing the participant's natural interaction. During the session, the observer used a laptop to take notes using Google Docs. A timing device was also used to track how long participants took to complete each task.

Experiment Design.

In this study, we compared the differences between two versions of a course scheduling system, the existing Carleton Central interface and a redesigned Figma prototype. These two interfaces represent the independent variable at two levels. The Figma prototype was used because it allows for full functionality of the task through a simulated auto scheduler.

Time was chosen as the continuous dependent variable because it provides an objective measure of task efficiency. A more intuitive and user-friendly interface should enable users to complete the scheduling process more quickly, thus we can assess whether the redesign leads to measurable improvements in performance.

We will also be looking at the severity of mistakes made categorised as

1. No mistakes

2. 1-3 *minor mistakes*[1]
3. 1-2 *moderate mistakes*[2]
4. 1+ *major mistakes*[3]
5. (DNF) did not finish.

This ordinal scale represents the categorical dependent variable in the study. It helps evaluate how error-prone each interface is, provides insight into where users tend to struggle, and gauges whether the changes in the interface were sufficient to reduce user frustration.

1. A minor mistake is classified as making a mistake that can be quickly rectified, such as clicking the wrong button
2. A moderate mistake is classified as 4+ minor mistakes or a mistake that requires significant backtracking, such as adding a conflicting course.
3. A major mistake is classified as 2+ moderate mistakes or a mistake that causes a significant amount of progress to be lost, such as not saving your work before moving onto another task requiring the original task to be redone.

This study used a within-subjects design, meaning that each participant interacted with both the original Carleton Central interface and the updated design. By having participants experience both interfaces, we can directly compare their performance and subjective feedback, controlling for individual differences that may affect usability outcomes. This approach is feasible because the steps involved in creating a schedule in the updated interface are significantly different from those in the original interface, meaning that users cannot easily transfer what they learn from one interface to the other.

The NASA-TLX questionnaire was selected as the subjective measure for this study. It was chosen over other questionnaires, such as the UEQ, because it provides more meaningful insight into usability improvements. NASA-TLX focuses on factors like mental demand, effort, frustration, and perceived performance after completing a task, rather than emphasizing aspects such as novelty or visual appeal. This makes it a better fit for evaluating how intuitive and cognitively demanding the interface is during task-based interactions.

A few confounds emerged during the study, and steps were taken to minimize their impact on the results. Some participants had already added courses during the selected term, which interfered with the baseline conditions of the study. As a result, their data was excluded, since a pre-existing schedule could affect task completion time, error rates, and overall task difficulty as it reduces the number of courses the user has to add. Additionally, some participants forgot one or more of the scheduling constraints during the simulation. In these cases, the valid constraints were repeated once, with no additional explanation or dialogue, in order to avoid influencing participant behavior or biasing the results. Since the experiment was conducted for the summer term, where a smaller courses selection is offered, participants were allowed to include one course they had previously taken in order to ease the added difficulty of creating a viable schedule.

Experiment procedure.

Individual participants arrived and were greeted before being led into the testing room. They were given a brief overview of the experiment and its purpose. Afterward, they

were instructed to set up their laptops in their designated area and provide their email address. A consent form was then sent to each participant via email. Once the consent form was signed and returned, participants were asked to sign in to Carleton Central and then look away from their screens.

At this point, the exact task instructions were provided. Participants were asked to begin from the Carleton Central homepage, navigate to the course registration section, select the Summer 2025 term, and choose the option to create a new schedule. Their objective was to build a course schedule that satisfied their degree requirements. All scheduling errors were required to be resolved, with two exceptions:

1. Errors that could be solved with a registration override requests were permitted.
2. Missing prerequisites were allowed if the participant would complete the prerequisite before the start of the summer 2025 term.

The participants were also instructed to think aloud, to aid the interviewer in identifying errors that occurred. Once the task began, the interviewer recorded the time taken to complete the scheduling task and observed any errors or issues encountered during the process.

After the task was completed, a NASA/TLX questionnaire was provided to the user through email. Following the completion of the questionnaire, a 20 minute break was provided in which the participant was escorted to a break room.

After the break, participants returned to the testing room, where they were provided with a link to the Figma prototype. They were given the same task instructions as before, but this time they completed the scheduling task using the redesigned interface. After completing the second task, participants filled out a second NASA-TLX questionnaire to provide feedback on the updated interface.

Finally, participants were thanked for their time, instructed to pack up their belongings, and escorted out to make room for the next session.

Results

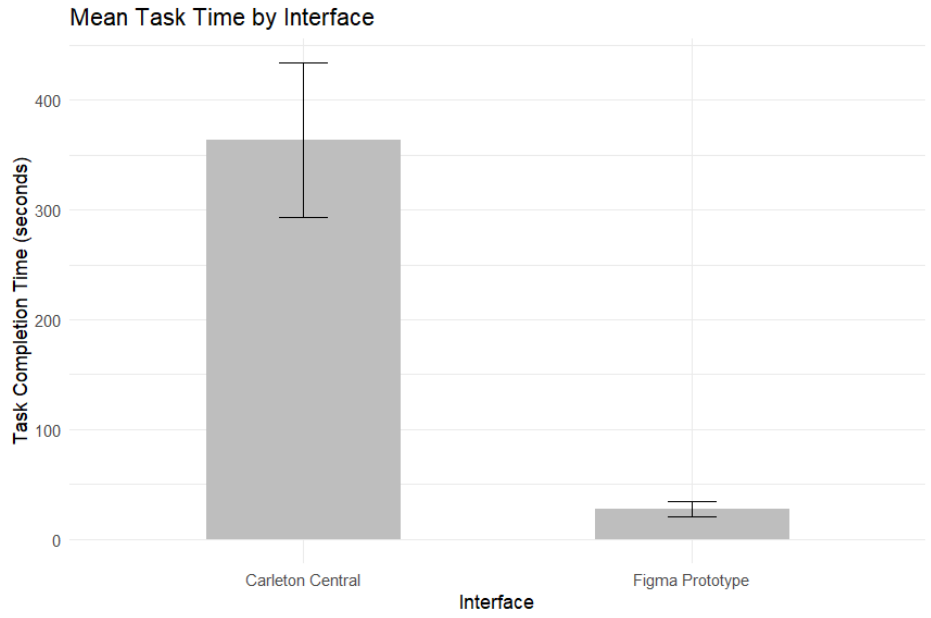
We will now compare the results from the time to see if there was a significant change. Since the experiment is within subjects we must perform a paired t-test. To perform the statistical calculations I will be using R. From (T2) we can conclude there is a significant difference in performance, $t(5) = 11.327, p < 0.001$. From (T1) we can see participants completed the task significantly faster using the Figma prototype (M = 27.42, SD = 7.36) compared to Carleton Central (M = 363.96, SD = 70.50). From (G1) we conclude that task completion times with Carleton Central showed considerable variability, while the Figma prototype showed more consistent results across participants. This suggests that the new design not only improved efficiency but also provided a more uniform and predictable user experience.

	Mean	SD
Carleton Central	363.96	70.5
Figma Prototype	27.42	7.36

(T1) Table showing the mean and standard deviation of the time to complete each task in seconds

T-test Results	t	df	p-value
	11.327	5	<0.001

(T2) Table showing the t-value degrees of freedom and p-value from the t-test results for the continuous independent variable (time).



(G1) shows the average time it took participants to complete each task.

From the results (T3) of the NASA-TLX survey, we can conclude that mental demand, effort, and frustration were significantly lower when using the Figma prototype compared to Carleton Central. Participants also reported feeling more successful in completing the task with the redesigned interface, indicating a more positive and manageable user experience overall.

	Carleton Central	Figma Prototype
Mental Demand	68.50	6.333
Physical Demand	5.50	4.167
Temporal Demand	4.17	0.833
Performance	64.17	99.5
Effort	65.83	3.667
Frustration	83.50	4.333

(T3) shows the mean response (responses are out of 100) in the NASA/TLX survey for each interface.

From (T4), there was a significant decrease in user errors when using the Figma prototype. No errors were recorded in the redesigned interface, whereas both moderate and major errors were observed when participants used Carleton Central. This further supports the findings related to task completion time, as users did not have to spend additional time correcting mistakes in the Figma prototype. This also enforces what participants reported in their NASA/TLX surveys, which reflected lower reported levels of mental demand, effort, and frustration when using the redesigned interface.

Participant	Carleton Central	Figma Prototype
1	Major Error	No Error
2	Major Error	No Error
3	Moderate Error	No Error
4	Major Error	No Error
5	Moderate Error	No Error
6	Major Error	No Error

(T4) shows the type of error each participant made.

Discussion

The results of the experiment indicate that the redesigned interface offers a significant improvement over the current Carleton Central interface. Participants completed tasks in substantially less time using the Figma prototype, demonstrating increased efficiency. In addition, NASA-TLX responses showed that users experienced lower mental demand, required less effort, and felt more successful when using the redesigned interface. Most notably, no errors were recorded when participants used the new design, whereas multiple moderate and major errors were observed with the original system. These findings suggest that the updated interface not only improved usability but also provided a more intuitive and satisfying user experience overall.

Appendix A

Data for time spent performing each task (in seconds)

Participant	Carleton Central	Figma Prototype
1	310.21	21.19
2	343.03	35.56
3	428.51	22.53
4	302.21	37.62
5	473.93	26.25
6	325.85	21.4

Data for type of mistakes Participants made.

Participant	Carleton Central	Figma Prototype
1	Major Error	No Error
2	Major Error	No Error
3	Moderate Error	No Error
4	Major Error	No Error
5	Moderate Error	No Error
6	Major Error	No Error

Data for NASA/TLX Survey (Carleton Central) (response by participant number)
Score out of 100

	Mental	Physical	Temporal	Performance	Effort	Frustration
1	90	0	0	70	85	75
2	59	5	0	80	85	70
3	85	15	15	85	25	90
4	87	0	0	100	100	91
5	100	10	10	60	100	100
6	80	3	0	60	80	75

Data for NASA/TLX Survey (Redesigned Interface) (response by participant number)
Score out of 100

	Mental	Physical	Temporal	Performance	Effort	Frustration
1	10	10	0	100	10	0
2	10	10	0	100	0	0
3	4	5	5	100	5	5
4	14	0	0	99	7	21
5	0	0	0	100	0	0
6	0	0	0	98	0	0

Appendix B

Consent form:
https://carletonu.az1.qualtrics.com/jfe/form/SV_3f0b1zJhPzncilE

NASA/TLX Survey For Carleton Central
https://carletonu.az1.qualtrics.com/jfe/form/SV_54G7P8hb34roMVU

NASA/TLX Survey For Redesigned Interface
https://carletonu.az1.qualtrics.com/jfe/form/SV_6SGjb3UY2XcOrvU

Figma Designs
https://www.figma.com/design/iqBNmlFBq6dbr9iYXJvluS/COMP-3008-Final-Project-Designs?node-id=1-2&t=Qc5xomOowUFRbCzh-0

Figma Simulation
https://www.figma.com/proto/iqBNmlFBq6dbr9iYXJvluS/COMP-3008-Final-Project-Designs?node-id=1-2&starting-point-node-id=1%3A2