Student Job Search Marketplace
Project Report
Version <1.0>

Abstract

Student jobs are difficult to find using existing web and mobile job search applications. Even with proper keyword searches and use of result-refining filters, the student job search remains a lengthy and cumbersome process. Applicants are required to sift through a number of irrelevant postings on several different job boards, each requiring the same information on sign-up. The many technical difficulties job-seeking students presently face using current software solutions lead to underemployment among educated young adults. In this report, we research our question of the effectiveness of current methods for students to find relevant jobs by comparing data results of current job search engines with our student exclusive job search software, called the Student Job Board, or SJB for short. We display the results of 20 users applying to student jobs using our app and again using a job search app of their choice in order to evaluate usability goals and user experience.

1. Introduction

In Canada, the number of students enrolled in high-level studies has been steadily rising for the past 30 years [1]. Similarly, the number of students participating in the labor market has been increasing [2]. However, research shows that few students get a job in their field of study whether it's before or after graduation, with some research suggesting an increase in those working minimum wage jobs while having completed post-secondary studies [3]. With our proposed Student Job Search Marketplace application, SJB, we aim to provide a solution that gives students relevant work experience, should they wish to work during their studies. Current solutions consist of public and private job posting platforms as well as universities introducing credited internships as part of their curricula [4][5].

1.1 Research Question:

Does a student exclusive job-search marketplace allow students to search for jobs that are more relevant to their skills and field of study in a more time-efficient manner?

1.2 Hypothesis:

In order to answer our research question, we will develop an application exclusively for individuals enrolled in part-time or full-time post-secondary studies. The app will focus on finding jobs related to the student's major. Also, the application will allow users to create a profile with attached cover letter and CV submission. Employers will solely examine applicants through their profile. Our **hypothesis** is that building a job market app focusing on students and their field of study will help them find **relevant jobs** and **accelerate the application process** by eliminating the need to create several accounts and submitting the same documents multiple times. The reason **why** we believe this method can answer our research question is due to 2 issues that students face when looking to combine work and study. First, there are students who

struggle to find employment in their field of study before completing their degree requirements and obtaining their diplomas. They must settle and depend on low-level jobs to support themselves and their education. Their current employment experience won't necessarily contribute to them acquiring the necessary skills needed to land a position related to their field of study after graduation. They will be greatly disadvantaged compared to students who have relevant experience when competing for the same job. Second, it is often the case when users apply for a job online, they have to create several accounts during the application process. For example, a user creates a LinkedIn profile to apply for a job. A job is posted on LinkedIn and the user clicks on the apply button. The user is then sent to another website to apply for the same job. This website requires the user to create another account to continue with the application process. In other cases, the user is sent to the company's official website where he has to create yet another account to submit his or her candidature for the position.

1.3 Theoretical contribution

Our motivation for exploring this issue is first-hand experience with the difficulties and challenges faced in finding and applying for student jobs while pursuing an academic degree. With technological advances and the emergence of web applications offering software solutions to everyday problems, job seekers are now tasked to search for employment opportunities online, whether on public and private job boards, company websites, and more recently, social media applications. Finding jobs to apply to is a lengthy process, and involves searching different databases by keywords, and applying restricting filters in hopes of finding relevant offers. The application process too is digitalized. Long gone are the days when CVs were handed to recruiters and cover letters were mailed to prospective employers. Today, a digital copy of supporting documents is attached to an online job application, which then goes through a screening process by means of an applicant tracking systems (ATS) [10]. Applicants' resumes therefore only get read by an actual person if they contain enough relevant keywords to pass through the ATS search filters. Given that this is a relatively new process with many shortcomings, we believe there is opportunity for improvement, especially for the student population of Canada. With our proposed study, we aim to add theoretical contributions to the causes of the current student underemployment problem by studying online job search and application processes.

2. Background/Related Work

According to Statistics Canada [2], the national workforce in 2015 included 2.4 million full-time students, who worked for both discretionary income and to help pay for their post secondary studies. However, students were typically found to be underemployed, working low paying jobs that weren't related to their field of study, and that didn't use the knowledge and skills acquired through their academic education. Indeed, the two most prominent sectors of the economy that

employed students were: (1) retail and wholesale trade and (2) accommodation and food services [2].

Today, most job applications are done online, whether on popular national job boards such as CareerBuilder[6] or Indeed[7], university job boards such as Concordia's CAPS online job bank [8] or social media websites like LinkedIn[9]. Though the internet has made it easier than ever to uncover employment opportunities, the process of finding student jobs and submitting an application remains incredibly time consuming and inefficient at matching skilled labour to relevant vacant positions in the job market.

Zielinski [10] presents findings from a survey conducted by CareerBuilder, a leading online job board. According to the survey, online job applications have a high abandonment rate, with 60% of applicants quitting mid-process because of how tedious and time-consuming they are to complete. Among the various causes for low application completion rates by online job-seekers, the most important are the following:

1. Asking applicants to re-submit and re-format resume information into fields in an application tracking system after they have already submitted their curriculum vitae.
2. Asking applicants to create two accounts: one to log in to the job site and the other to apply for the job on the employer's website.
3. Publishing job offers that have long descriptions that require a significant amount of time to read.
4. Having an application platform that is not mobile device-friendly.

An emphasis is put on this last point, especially since more and more people begin their job search on their cellphones. Job-seekers are likely to abandon the process if the application length is exaggerated on the small screen of their mobile devices. Zielinski [10] proposes two notable solutions to the problems listed above in order to increase the rate of completion of mobile job applications:

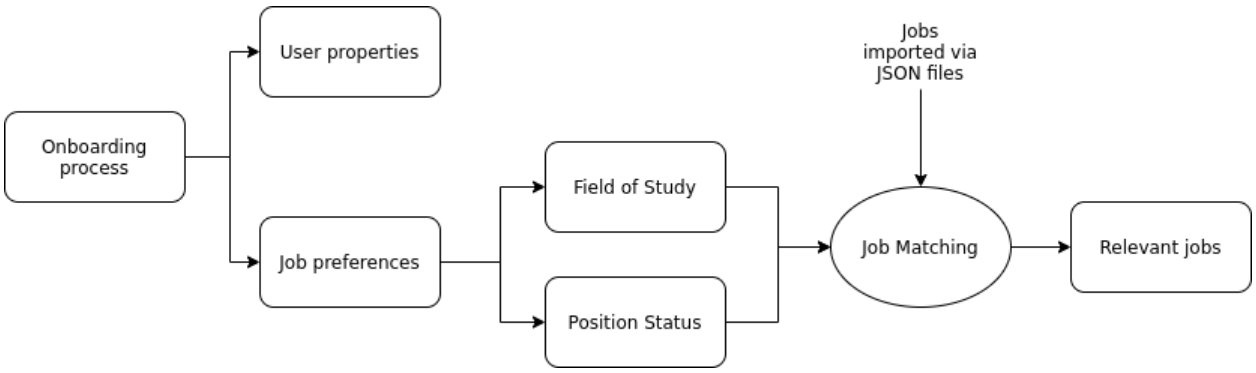
1. Reducing the number of screens that job-seekers need to navigate during the job search and application processes.
2. Shortening the application process length to five minutes or less.

With our proposed software solution for a student job search marketplace, we intend to apply these recommendations to our mobile app design and study the resulting user experience of applying to student jobs with our system as opposed to the commercial systems that currently exist.

3. System Development/Design

To evaluate our hypothesis, we have developed a mobile application using Flutter (v. 1.18.0), an open-source UI software development toolkit by Google. The version of the Dart SDK, used by Flutter, was 2.9.0. The application uses a handful of package libraries each serving a purpose in the grand scheme of things. For instance, the *provider* package serves as a way to keep a state for the user while they browse through the application such that they don't have to resubmit actions. The development of the application was done via Visual Studio Code.

The application uses JavaScript Object Notation (JSON) files as a means of storage for importing and exporting user information, as well as potential listings. The application's functionalities can be modeled by the following diagram.



The user's journey through the application is straightforward: first, they determine their profile, then their job preferences. The former include their name, email, password, date of birth, city. The latter include their field of study, their resume along with their position status (full-time or part-time). Once this is done, the user can then go to the listings page of the application to view all the listings that match their profile. Should they be interested in a specific listing, they can choose to apply to it.

Once data is obtained during registration, the state of the system is set to match that of the user's such that relevant jobs will be matched, e.g., the user will not see a part-time listing if they're looking for a full-time position. All listings are selected but those shown have the same field of study, and position status properties as that of the user's.

This study focused on applying filtering through 2 basic filters, as stated: position status (full-time or part-time) and field of study (finance or software engineering). Given this design, however, we are able to include additional filtering criteria based on the evolving nature of the job market, e.g., matching on desired internship term if no improvement was seen.

4. Method

Adjusting our methods due to constraints placed on time and resource availability, we chose to test our hypothesis by running a field study involving 20 software engineering students split into 2 groups of 10. Before the start of the experiment, all participants were asked to fill out a pre-test questionnaire in order to establish their basic profile and assess their experience with the online student job search and application process. Participants were later asked to run our mobile app, with 10 students tasked with finding and applying to part-time positions, while the other 10 were tasked with finding and applying to full-time positions. For the purpose of comparison, students were then asked to complete the same tasks using an existing job searching site. As part of the instructions given to the users, each student was told to record participant notes while they tested our Student Job Search Application. These notes were meant to provide user insights on the app, including strengths and weaknesses of our software solution. After the experiment, each student was asked to complete an online questionnaire regarding their experience using the application. They were also asked about the differences observed from using other services along with the efficiency of the application at directing students to relevant jobs. Furthermore, it is through this questionnaire that we also collected the participant notes taken during the testing phase.

4.1 Identifying Participants

Before we could begin our study and start collecting user data, we first had to find participants among our user population. The Student Job Marketplace app is intended for individuals enrolled in part-time and full-time post-secondary studies. Though our original intent was to use a random sample of Concordia students by recruiting them in-person using data triangulation, we were forced to settle for convenience sampling amongst our peers, fellow software engineering students. Because the results of such a sample are less robust, they apply only to the study population and cannot be generalized to the entire user population. Due to time constraints, we also needed to make sure to obtain a high rate of response which is why we opted for a sample of 20 SOEN students. By contacting them individually, we were able to achieve a 100% completion rate among the students who agreed to participate in our study.

4.2 Study design

Once we developed the prototype for our proposed student job marketplace, we ran a field-study with 20 participants since we had to choose a remote method for data collection. The study began with a pre-test questionnaire, assessing the student’s experience with, and opinions on existing online student job search and application options. These questions are displayed in Table 1 below:

Table 1: Pre-Test Questionnaire

Questions	**Reasoning**
What is your gender?	Demographic information
What is your age group?	Demographic information
Have you ever searched for student jobs online?	To evaluate the user's prior experience with online job searching
Have you ever completed an online application before?	To evaluate the user's prior experience with online job applications
Which platforms have you used to find student jobs online? Please select all that apply.	To evaluate the user's prior experience with different job application platforms
The online platforms used to find student jobs were efficient at displaying job offers related to your field of study. (Likert scale)	To assess user opinions about the efficiency of currently available online job boards at sorting relevant job listings according to user preferences
During your job search, how much time per day did you spend, on average, looking for relevant job postings?	To evaluate the efficiency of currently available online job boards at sorting relevant job listings according to user preferences
Once you found a relevant job posting, how much time did you spend, on average, completing the job application.	To evaluate the time taken to fill out job applications by users on currently available job boards
Have you ever abandoned a job application mid-process?	To evaluate the user's pain points related to the online job application process
Why would you abandon a job application? Select all reasons that apply.	To evaluate the user's pain points related to the online job application process

Next, participants were asked to run the app with specific instructions. Half of our recruited subjects were asked to use our app to find and apply to part-time software engineering jobs, while the other half were asked to do the same with full-time jobs. Participants completed two iterations of job searching; one with our app and the one with a random competing product of

their choice. The guidelines given to the users along with a list of tasks to complete during the experiment are listed below:

Instructions for the User

- Open the application
- Select register
- Enter your name, email and password
- Enter your date of birth
- Enter your city
- Choose your field of study
- Upload your resume
- Enter whether you're looking for a full-time or part-time position
- Select Visit Listings
- View listings that match your profile
- Click on the Apply button to submit your application for a chosen job
- Record notes during the job search and application process. Notes can include thoughts about the mobile app, its strengths and weaknesses, etc.

List of tasks for SJB app

- Start a timer.
- When finishing to apply to your first job, record the time.
- Stop the timer when you are finished applying for jobs and record the time.

List of tasks for other job app of user's choice

- Start a timer.
- When finishing to apply to your first job, record the time.
- Stop the timer when you are finished applying for jobs and record the time.

During the experiment, each student was required to note down any thoughts they had while using the mobile application. These notes, along with other qualitative and quantitative data were recorded via a post-test questionnaire. The answers given to these questions, shown in Table 2 were then used to evaluate our hypothesis.

Table 2: Post-Test Questionnaire

Questions	**Reasoning**
What type of job did you search for?	To account for any discrepancies between the number of part-time and full-time positions
Participant notes	To evaluate the satisfaction of the user
Using the SJB application	
How many jobs did you apply to?	To evaluate the efficiency of the app.
How much time in minutes did it take you to apply to these jobs?	To evaluate the efficiency of the app.
Did you abandon any job applications?	To evaluate the efficiency of the app.
From the beginning of your job search, how much time in minutes did it take you to apply to your first job?	To evaluate the user's ability to find and browse through the job postings.
The job postings were relevant to your field of study.	By getting this metric, we will be able to determine the efficiency of our filtering system.
The job postings were relevant to your preferred position type (Full-time, Part-time).	This metric helps determine how helpful our filtering system was related to the user's interest in full-time or part-time listings.
The student job search and application process was easy.	To evaluate user satisfaction
Using the job search app of your choice	
How many jobs did you apply to?	To evaluate the efficiency of the app.
How much time in minutes did it take you to apply to these jobs?	To evaluate the efficiency of the app.
Did you abandon any job applications?	To evaluate the efficiency of the app.

From the beginning of your job search, how much time in minutes did it take you to apply to your first job?	To evaluate the user's ability to find and browse through the job postings
The job postings were relevant to your field of study.	This metric helps determine how helpful our filtering system was related to the user's field of study.
The job postings shown were relevant to your preferred position type (Full-time, Part-time).	This metric helps determine how helpful our filtering system was related to the user's interest in full-time or part-time listings.
The student job search and application process was easy.	To evaluate user satisfaction

The key metrics derived from our analysis include the following:

1. Average number (μ_n) of job postings applied to;
2. Average time (μ_f)to apply to the first job posting;
3. Average time (μ_j) to apply to job postings;
4. Aggregate Relevancy attribute (μ_r), i.e., "Did the job postings they saw fit their profile?" ranging from Strongly Disagree (0%) to Strongly Agree (100%) meaning extremely relevant;
5. Abandonment rate (*r*);

4.3 Evaluation Methodology

We evaluated each participant and analyzed the 6 resulting metrics in terms of usability goals and user experience.

Usability Goals

Our main goal here is to measure efficiency, learnability, and memorability. In particular, we want to see how many job postings each user applies to via our application versus the current method. We also want to see how fast a user learns and remembers how to use our app from the first job posting compared to subsequent job postings.

Our success criteria are

1. Users apply to more job postings with our application (efficiency).
2. Users require less time to apply to the first job posting and for all job postings (efficiency, learnability, memorability).

User Experience Goals

Our usability goal is to give student job-seekers a useful and usable user experience. After the experiment, our questionnaires will list questions focusing on our users' opinions on our app's efficiency, learnability, and memorability. This will give us an honest point of view from the user instead of just analyzing our data.

4.4 Biggest Risks

1. Implementation

The riskiest component of this project will be the implementation within our given timeframe. Flutter, which is a relatively new development platform, will be used for the implementation of our project. The newness of Flutter also means that there is not as much documentation and resources available whenever needed. Because of this, we might run into some issues while coding and take longer to find solutions to fix issues. To mitigate this risk, all team members will be following online courses and tutorials about Flutter.

2. Flaw in relevant job suggesting algorithm

Perfecting the job suggesting algorithm may take long especially given all the different majors and qualifications a user may have. Mitigating this risk is difficult because it is a natural part of the development process. It could be mitigated by observing how filtering algorithms are implemented in different applications.

3. Difference in skills levels between team members

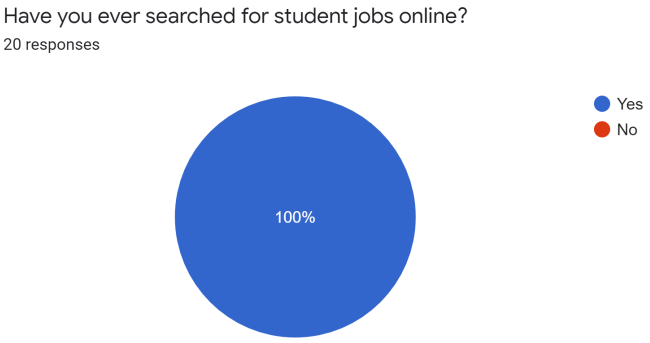
In addition, there are differences in levels of designing and programming skill between the team members which might slow down the process. This gap will realistically never be filled in such a short amount of time. However, it can be mitigated by following online courses and tutorials on the matter.

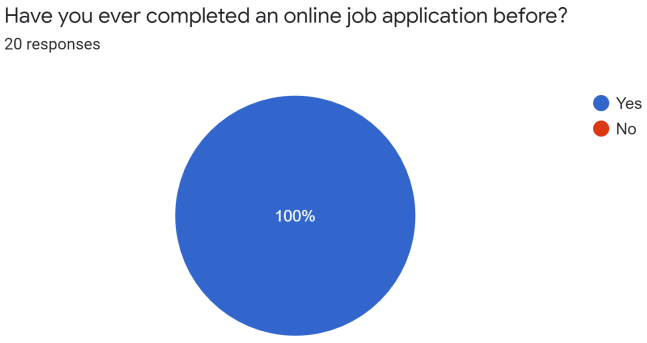
5. Results

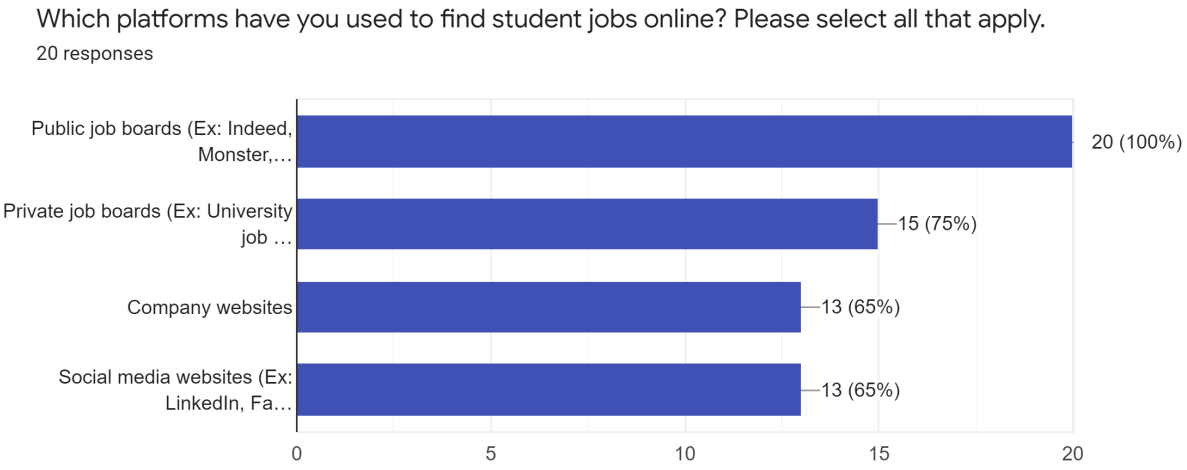
In this section, we present the results of our user data, collected from the pre-test questionnaire and post-test questionnaire. The results of the post-questionnaires are in two parts: the first part presents results from the use of the SJB app, while the second part presents results from other online job boards, as chosen by our participants.

5.1 Results from Pre-Test Questionnaire

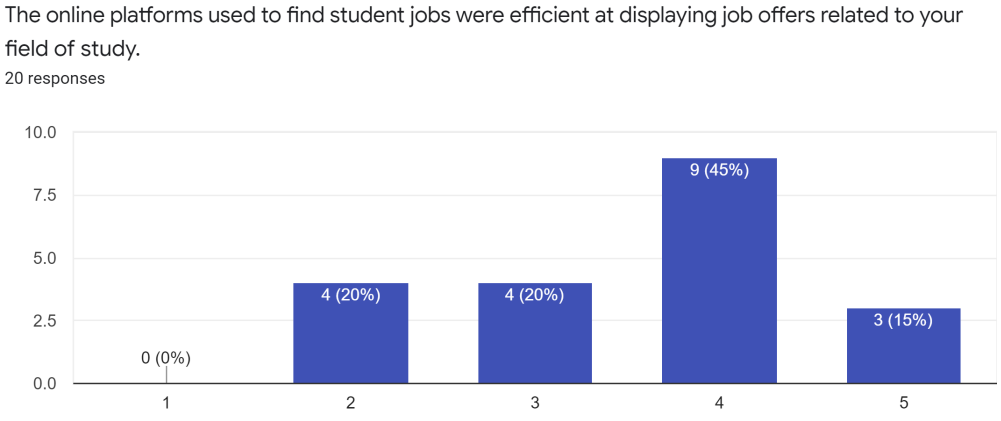
We preceded our test with a questionnaire in order to get a better understanding of our user's experience with the current online student job search and application process. Based on our results, all of our users have previously searched for and applied to student jobs online. In descending order, the platforms used to find student jobs online are public job boards, private job boards, company websites and social media websites.



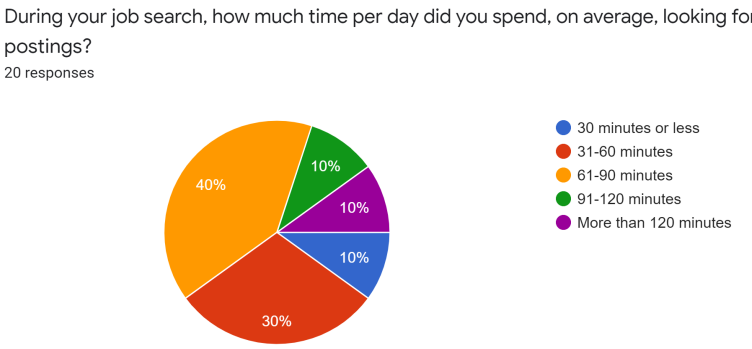


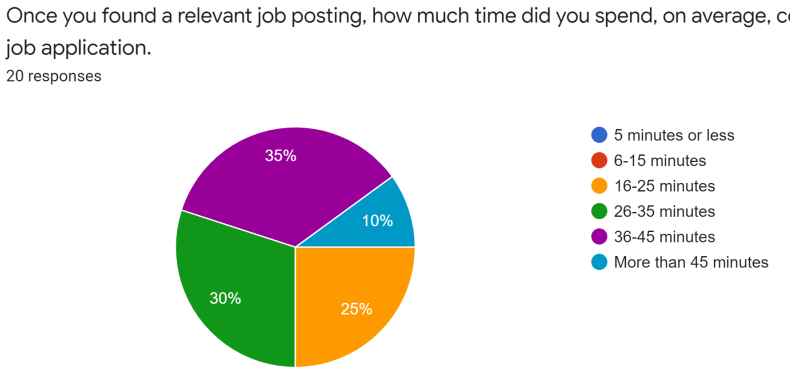


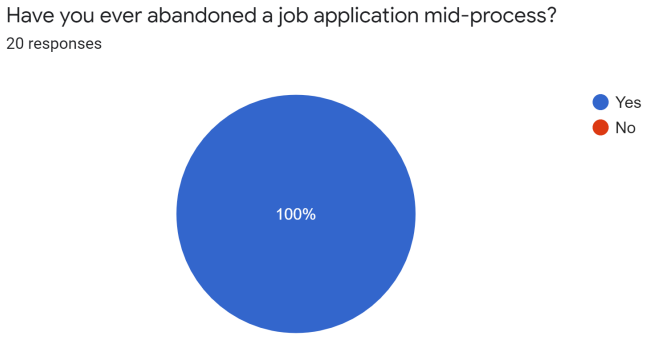
Most users found that existing online job search platforms were inefficient at displaying job offers related to their field of study. The rating below is based on a likert-scale of 0 to 5, from Strongly Agree to Strongly Disagree.



Most participants spent between 61-90 minutes a day searching through job listings for job postings they would be interested in applying to, and once a relevant job was found, report spending on average between 36-45 minutes completing each application. Given the length of time spent searching for and applying to jobs using current software solutions, it comes as no surprise that all our study participants report having abandoned a job application mid-process in the past.

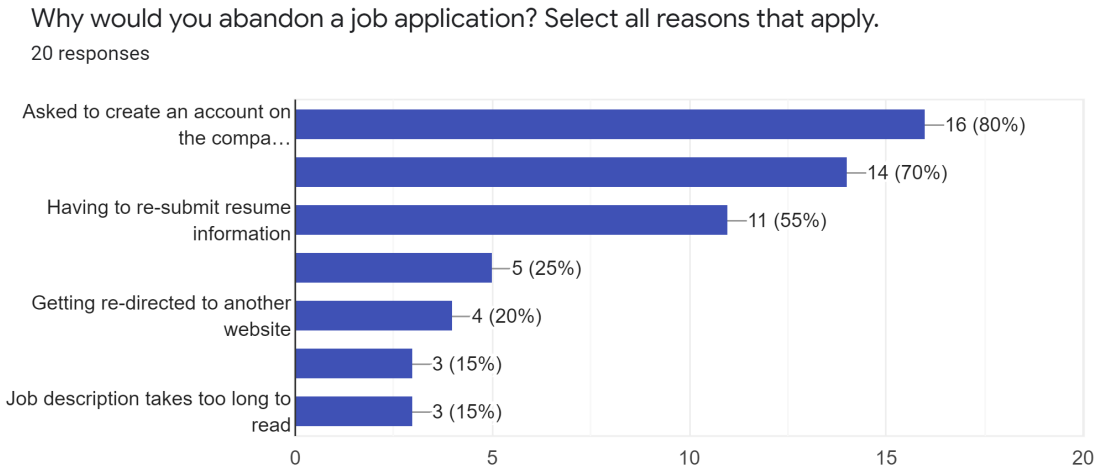






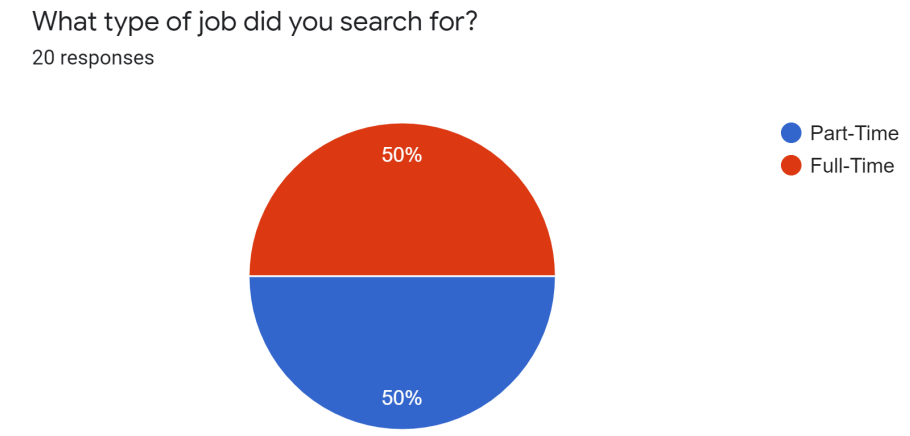
The top 3 reasons for abandoning a job application before submission are the following:

1. Asked to create an account on the company website (80%)
2. The application process takes too much time (70%)
3. Having to re-submit resume information (55%)



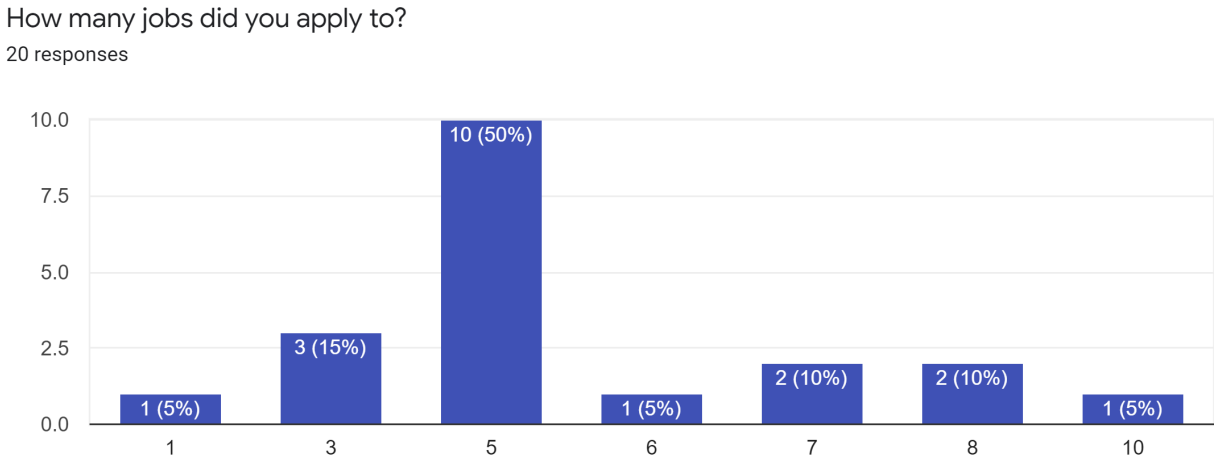
5.2 Post-Test Questionnaire

Once users completed the test, they were asked to fill out a second questionnaire. Half our users were tasked with searching for part-time jobs while the other half searched for full-time jobs. Based on our results, no significant difference was found in the user experience of the two groups.

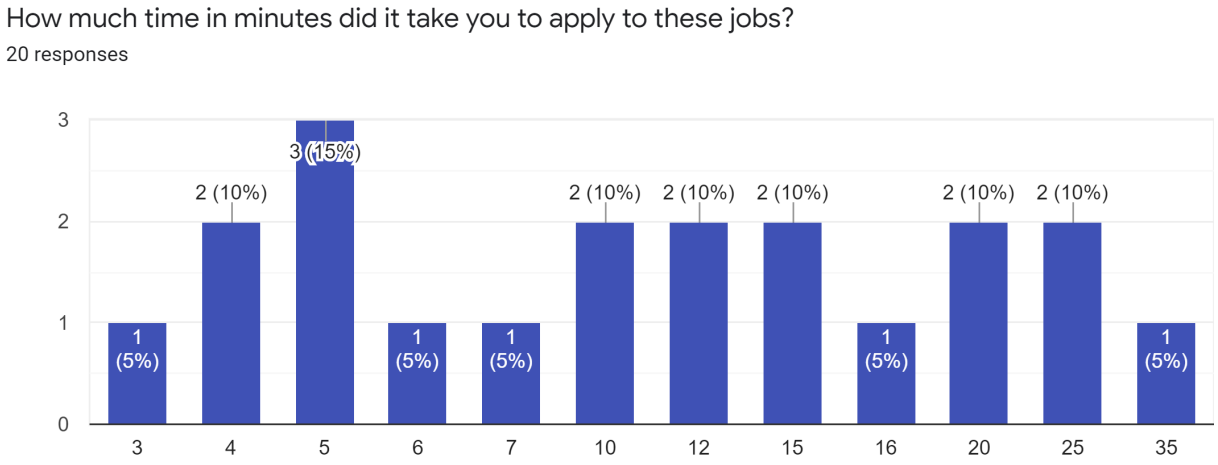


Among the 20 participants, half of them searched for part-time jobs and the other half were seeking full-time jobs.

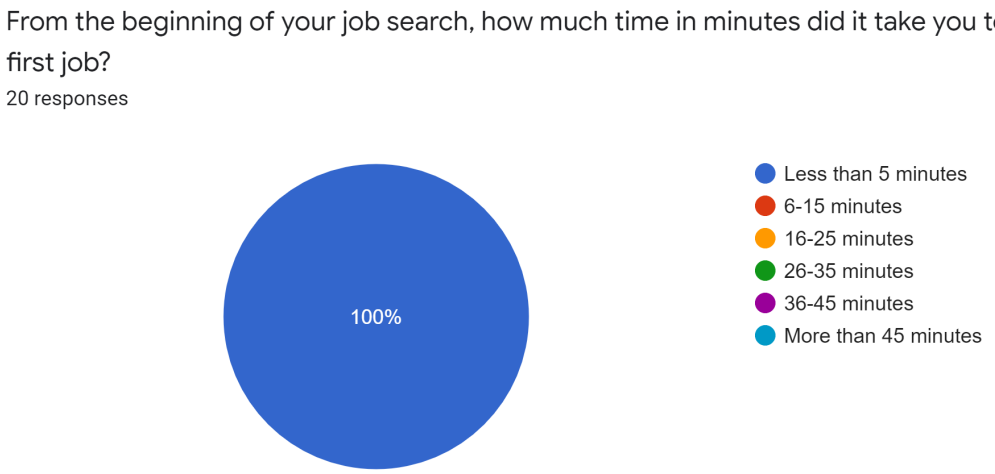
Using the SJB App:



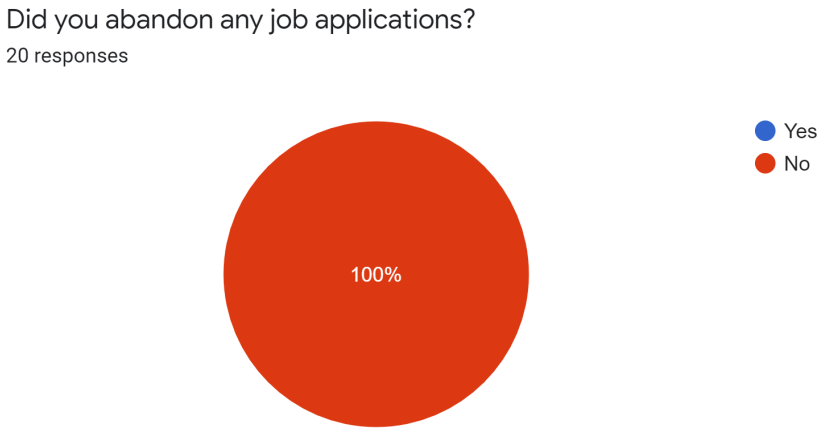
In total, the 20 participants applied to 106 job postings with the SJB app, averaging to 5.3 jobs per participant.



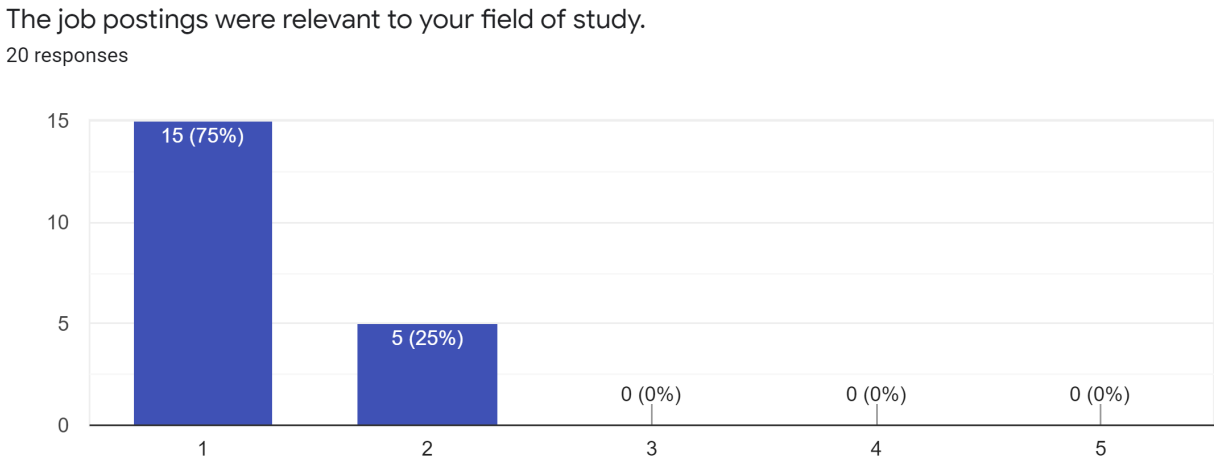
A total of 254 minutes were spent applying for jobs. There were 106 jobs applied to. On average, each user took 2.4 minutes for a single application and a total of 12.7 minutes applying for jobs when using the SJB app.



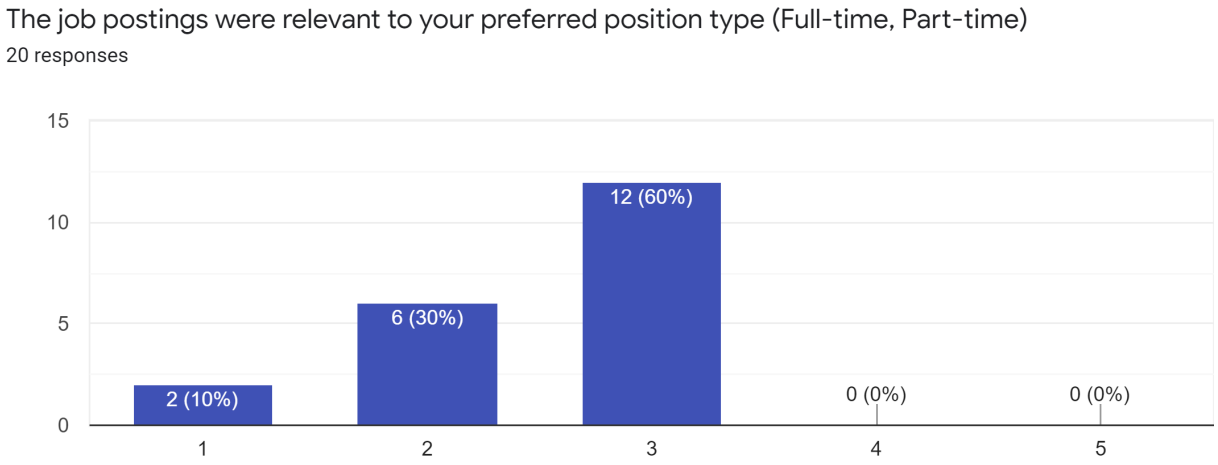
All 20 participants were able to find and apply to a job within 5 minutes of their search.



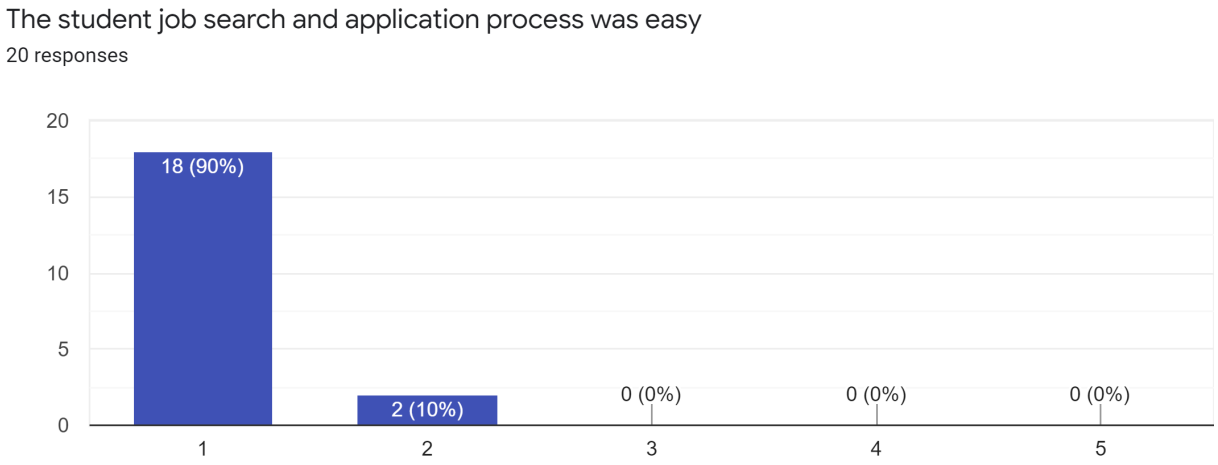
None of our 20 participants abandoned a job application while using the SJB app, because of our single-click application process.



On the likert scale, all participants agreed that the job postings were relevant to their field of study, with 15 strongly agreed responses.

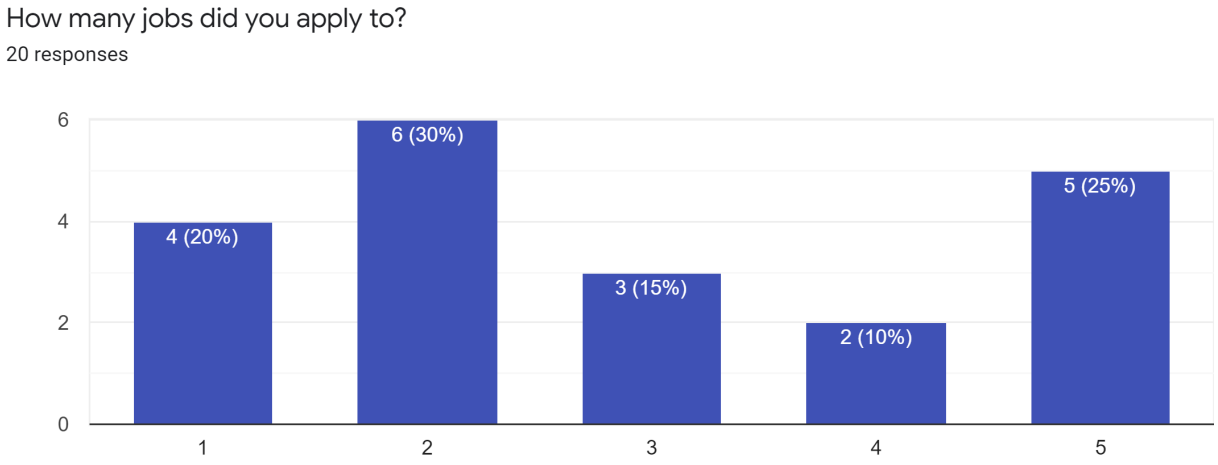


Most users gave a neutral response on the likert scale when asked if the postings that were displayed were relevant to their chosen position type (full-time or part time). This is most likely due to the fact that the job postings on the SJB app don't explicitly mention if the position was full-time or part-time once the user clicked on View.

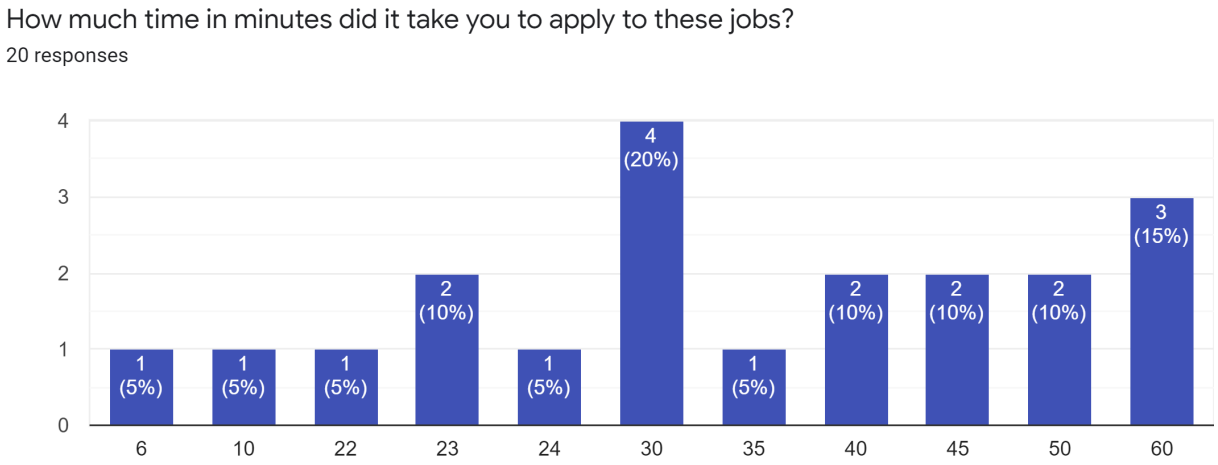


The good majority of participants found that the job application process was easy when using the SJB app.

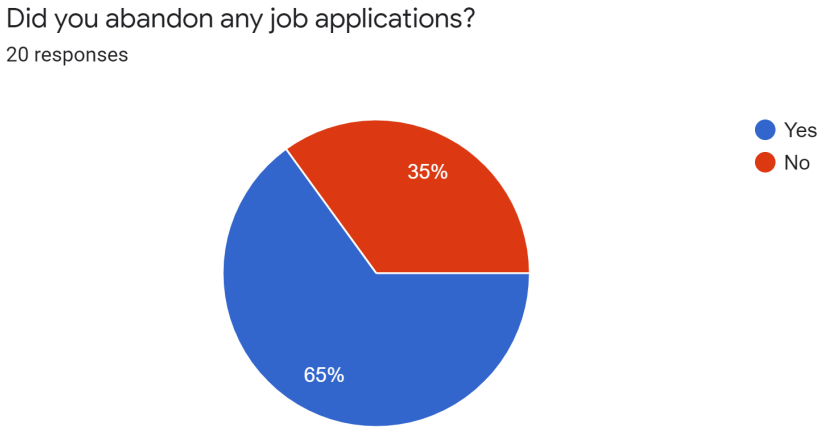
Using the job search app of your choice:



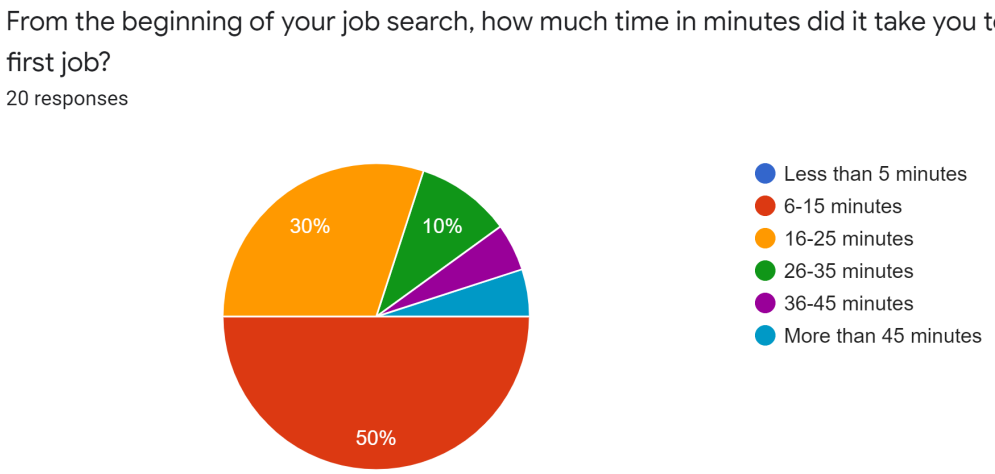
There were a total of 58 job applications using the participants job search app of their choice. This averages to 2.9 jobs applied per user.



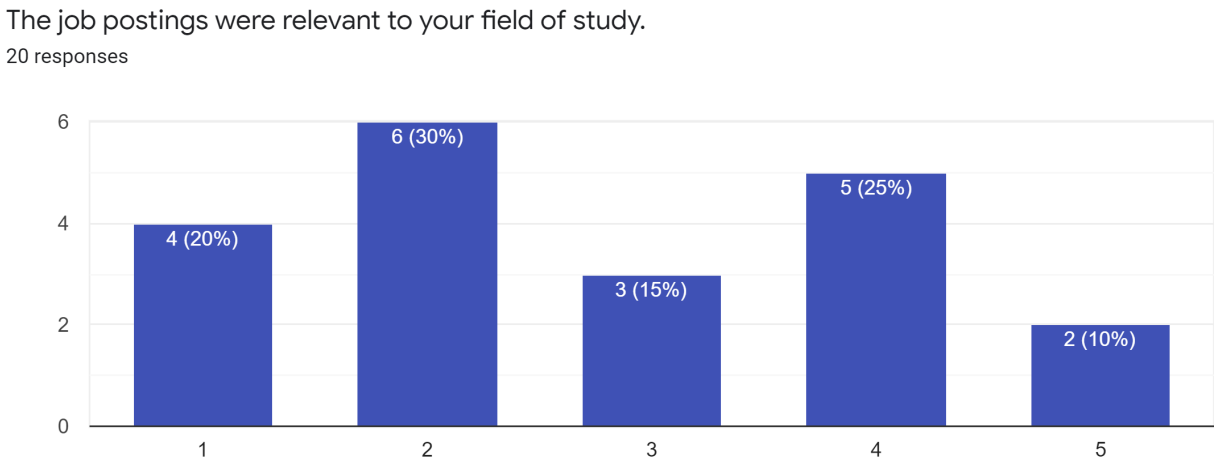
A total of 713 minutes were spent applying to jobs when participants used their job search app of their choice. 713 minutes spent on 58 job applications equals to over 12 minutes per application and each user spent 35.65 total minutes applying to jobs.



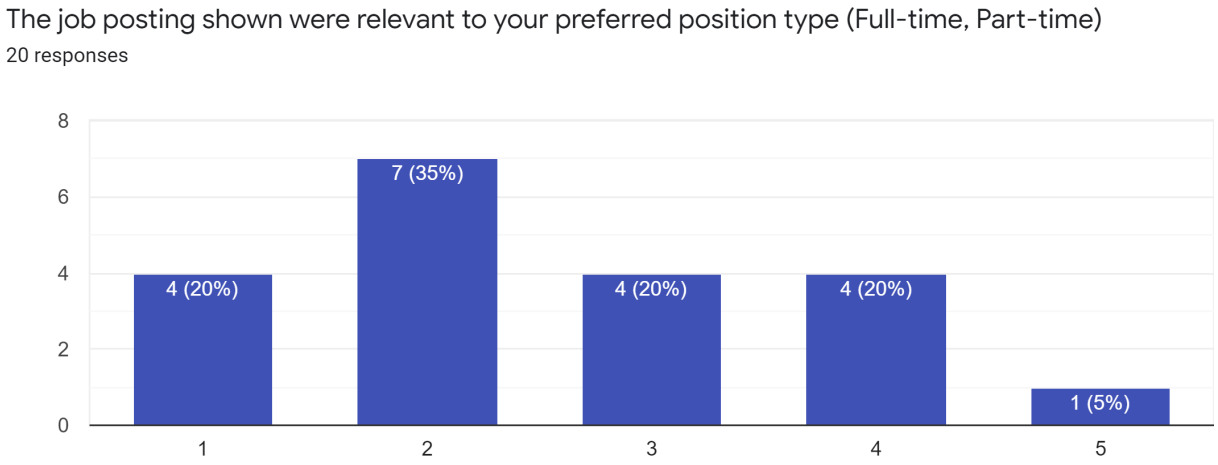
Job application abandonment was at 65%. That means 13 participants gave up on the application at least once during the search while using the job search app of their choice.



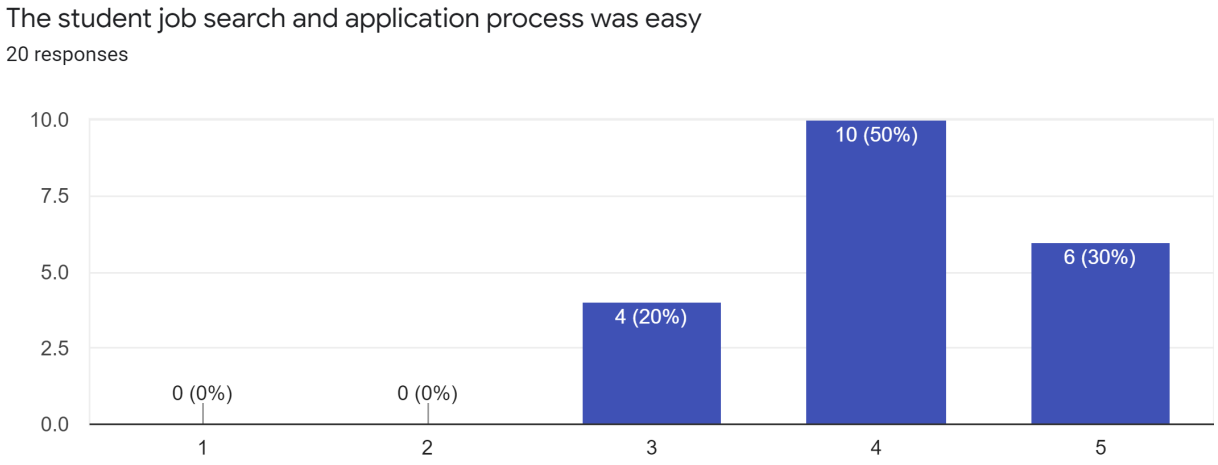
Half of the participants spent between 6 to 15 minutes before successfully applying to the first job using the job search app of their choice.



On the likert scale, the results were very spread. This could imply that the job search apps that the participants chose were very inconsistent.



On the position relevancy, 75% of the participants varied between neutral to strongly agree. Only 25% of the participants were unsatisfied in some way of the position type relevancy from their job app.



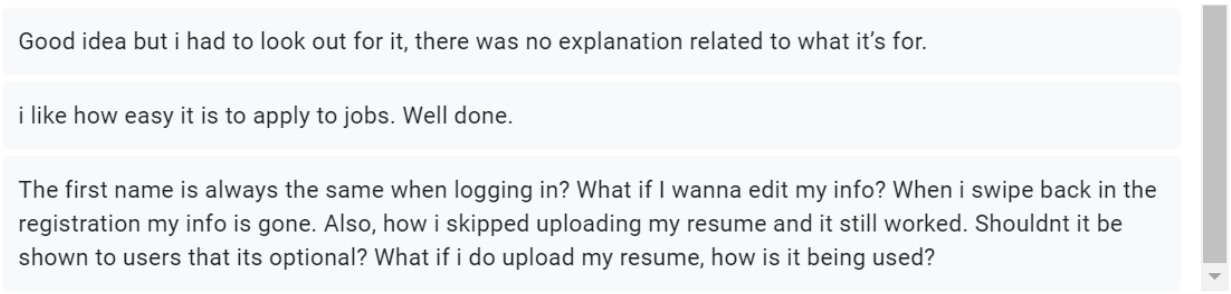
None of the participants agreed that the process was easy when using the job search apps of their choice. Most users agreed that they were unsatisfied and only 20% had a neutral stance.

Participant notes:

20 responses

- The listing does not specify if part-time or full-time position
- Add a way to view and change my profile
- I don't like the colors of your app, it's too bland. It needs more colors!
- Good app but the ui was a bit lacking after logging in
- I liked not having to create any additional accounts on company websites
- There could have been more transitions in UI, colour scheme could have been more vibrant.
- Sometimes, when applying to jobs, I like to give different cvs depending on the job posting. Maybe you could add a way to choose which cv to display when I apply to a job. Or at least let me upload one instead of having to just the one you make us upload at the beginning.
- Can you edit the CV upload? What if I want to add some relevant information?

- the interface Is too white
- Decent
- There is no option to make any modifications to your account or your CV submission.
- It needs more options or a way to filter the jobs list(location, type of technology used, etc)
- The interface is clunky but i like the swiping in the registration.
- Needs a filtering program and then it gives me a list of jobs from my filters.
- simple, straight to the point design.
- Filtering options based on programming language would be nice
- Not bad



6. Discussion

From the results below, we can see that the majority of the users had a more efficient use of their time by using the SJB application.

A detailed breakdown for key metrics is given below (with n=20), derived the data obtained:

Metric	**SJB**	**Others**
Average number of job postings applied to (μ_n)	**5.3 jobs**	**2.9 jobs**
Average time to apply to the first job posting (μ_f)	**< 5 mins**	**6 - 15 mins**
Average time to apply to job postings (μ_j)	**12.7 mins**	**35.65 mins**
Average relevancy score for study field	93.75%	56.25%
Average relevancy score for position status	62.5%	61.25%
Average relevancy score (μ_r)	**78.125%**	**58.75%**
Abandonment rate (*r*)	**0%**	**65%**

We believe the application helped users in finding better jobs due to the relevancy rate being higher with SJB than with other applications. The number of applications almost doubled from 58 to 106. This is also shown using μ_n. As per the time taken to complete job postings, improvements were made but no specific conclusions can be drawn due to the nature of the result (ranges were given as a choice). The abandonment rate being at 0% shows we've successfully eliminated this pain point from the application process.

6.1 Relevance of results

Some of the questions asked in the post-test questionnaire pertain to efficiency and time.

The results of this study apply only to our participants and not to the entire user population. Given this information, to be able to generalize results, we would need a more significant sample size chosen using random sampling techniques. This would allow us to better interpret statistical measurements with a higher degree of confidence.

Limitations in terms of time as well as the context caused by the coronavirus made our methods of sampling non-random. Our data gathering methods were limited to remote methods due to social distancing. We had to squeeze out as much information from the questionnaire as possible all the while making sure this information was applicable in the study.

6.2 Limitations of our work

The limitations of our work is presented below and is based on participant feedback:

- There is only a limited amount of job postings for users to choose from. Currently, job listings are added/categorized manually. An upgrade to this system (fully autonomous) would require the development of a matching system based on jobs pulled from various competitor websites. This matching system would categorize job attributes in order to get what's compared, i.e., our filtering criteria.
- Our system currently only supports filtering via 2 fields: position status and field of study. More granular results are not being taken into account in spite of the fact that resumes are uploaded. Additionally, other info (not related to the resume) can be asked of the user such as job period desired.
- Some fields, e.g., name and password are not modifiable after signing up.
- It's not clear which parts of the resume are being used upon submission. Some users wished to submit different resumes instead of always using the same one.
- The app's colors are not consistent (Pink-ish job listing background but blue-themed registration/login)
- In-app instructions and the purpose of the app are not provided to the user before they sign up or login.

7. Conclusion

With this project, our goal was to explore if a student exclusive job-search marketplace would allow students to search for jobs that are more relevant to their skills and field of study in a more time-efficient manner. To do so, we built a mobile student job board application. The time-effectiveness of the application was measured by studying the user experience, specifically factors such as efficiency, learnability, and memorability of our application.

Through the SJB application we wanted to see how many job postings each user applies to via our application versus the current method. We also wanted to see how fast a user learns and remembers how to use our app from the first job posting compared to subsequent job postings to help them find relevant jobs and accelerate the application process by eliminating the need to create several accounts and submitting the same documents multiple times. Through comparison with existing online job application platforms we were able to evaluate efficiency, learnability, and memorability of our application.

In conclusion, our hypothesis that building a job market app focusing on students and their field of study will help them find relevant jobs and accelerate the application process by eliminating the need to create several accounts and submitting the same documents multiple times is fully supported because based on the data we gathered, we were able to deduce that the SJB application was efficient at finding better job matches due to the relevancy score for SJB being higher compared to one received for other job search platforms. SJB also eliminated an important pain point by showing a 0% abandonment rate. Finally, SJB also scored lower on the average time needed to apply for job postings for a higher number of job applications sent out proving that this application is better on all aspects.

Potential extensions and future work:

Based on the feedback we received, we can see that our application is good in concept. However, multiple improvements can be made on the user experience of the application. Indeed, multiple comments were made about the user interface being lacking. We can therefore conclude that there is a need for such an application amidst the student population. Finally, from this feedback, additional criteria could be provided to the user to make their experience a better one. In short, taking what users have given as feedback can result in students finding better jobs easier.

Appendix 1: Raw Data - Completed Questionnaire

The completed pre-test and post-test questionnaires have been attached in their respective files along with the submission.

Appendix 2: Raw Data - Video Demo

Two videos are attached to this submission. One that demos a software engineering student looking for part-time employment using the SJB app, and another where a software engineering student searched for full-time employment using the SJB app.

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