50.006 User Interface Design & Implementation
Mid-term Report

Tinker
Match Makers

Team 6

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Background

As makers or creators, gaining access to fabrication equipment like 3D printers can be a challenging process. In an online survey conducted on engineering students[1], 75% of the respondents experienced difficulty in accessing a 3D printer. This is due to various reasons such as the high cost of these equipment and the difficulty for beginners to maintain them.

For example, budget 3D printers can be as affordable as $380 and can cost up to thousands of dollars. However, lower-end printers often cannot achieve the level of detail required in more complex prints, and have a smaller print volume. These printers also lack flexibility and can be less reliable, resulting in a higher frequency of failed prints. Different printers also use different filament materials with different properties, providing different quality prints for different uses. Some users may also want to make a large volume of prints within a short period of time, hence they may want to utilise many printers to balance the load.

Makers often only require short usage of such equipment (i.e. short jobs), making it impractical for them to purchase the entire equipment for their DIY projects. At the same time, makers who own such equipment tend to face problems of underutilisation of their equipment. For example, DIY enthusiasts may find the usage of their printers fluctuating and may only be using the printers frequently when they have an on-going project. After which, the equipment may sit untouched for months which is highly wasteful.

From these observations, we noticed that there was an opportunity to create a platform that can address the needs of the two groups mentioned above, by matching them. In the same survey mentioned above, 91.7% of the respondents were interested in a peer-to-peer fabrication service.

Problem Statement

The team wishes to tackle the problem of inaccessibility of fabrication equipment like 3D printers and the underutilisation of the equipment by the makers who own them. We envision developing an online marketplace as a platform to link makers who need to use fabrication equipment ('client') with makers who own these equipment ('owner'). Owners can thus maximise the utilisation of their equipment by accepting jobs[2] from clients through the platform, while making fabrication equipment more accessible for the clients.

Based on the above task description, the basic requirements for design are as follows:

- Clients should be able to select the type of equipment they need and upload relevant software files (e.g. an stl file for 3D prints) for a job
- Owners can register their equipment for rental
- Owners can manage the jobs' schedule

Additionally, the user interface should ideally support multiple interaction platforms, like mobile and desktop, to increase user coverage.

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[1] Survey results are found in the Appendix.

[2] A job refers to a task that is sent to the fabrication equipment. For example, a print job is a task that is sent to a printer and the job would be completed when the print is completed.

Target Users

Makers come from all walks of life and vary widely in their age group, technical expertise and tech savviness. For the first iteration of our user interface, we intend to target makers who are comfortable with using browsers on computers and smartphones and are relatively tech savvy. We chose to target this group of users for several reasons. Firstly, this group possesses pre-requisite technical knowledge that is needed to efficiently operate computers. Secondly, this group of users are also more widely available and would provide us with easier access to conduct ethnographic studies in the second half of the term. These users can be further broken down into two groups, namely beginner makers and experienced makers.

Novice Makers

The first group of users we are targeting are beginners who are new to the maker culture and our application

When a person is looking to get into 3D printing, he/she may not know much about choosing materials to print with, the mechanical properties of a material, the print settings to tweak and other parameters associated with an ordinary 3D print job.

Hence, users in this category would typically need some introduction to the various aspects of 3D printing. Prompts and tips of the day can help ease this group of users into the maker culture and to our application. Preset or default options could also be helpful for this group of users.

Experienced Makers

More experienced users who have been in the maker culture for a longer period of time. This includes 3D printing enthusiasts and 3D printing business owners.

Users in this category would require actions to be done in a quick manner. As such, various printing parameters have to be quick to access and easy to tweak. Users in this group would also require more fine tuned control such as using custom printing settings instead of using default ones.

Literature review

Online Marketplace

Carousell

Carousell offers buyer to buyer (B2B) rental of equipment or services. Being a general B2B marketplace allows for users to sell many different varieties of services. However, it lacks the features we require such as duration of borrowing an item, availability of item and deposits to be placed before an item can be rented.
Source: https://sg.carousell.com/search/3d%20printing?

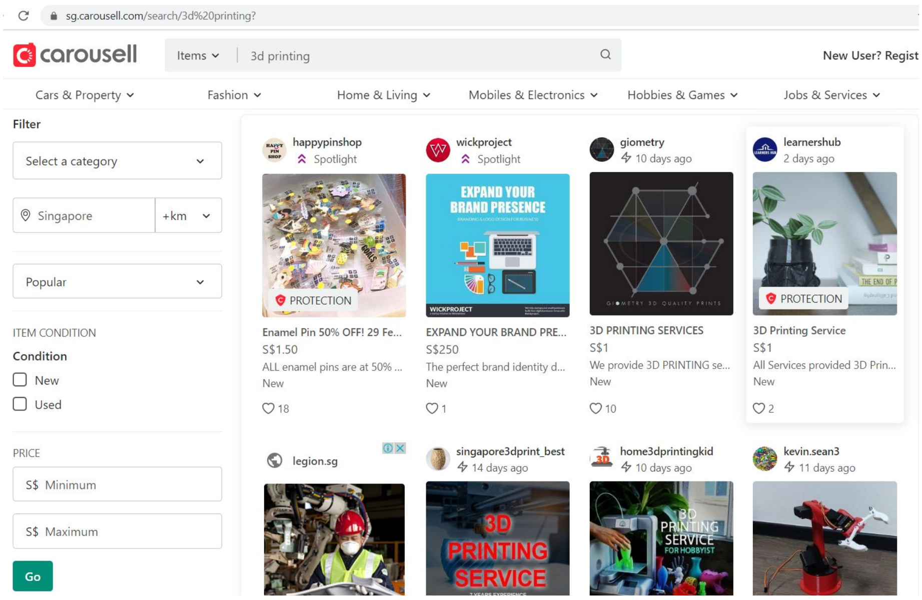


Figure 1: Carousell Search Page

Evaluation

- Pros
  - Aesthetically pleasing interface
  - Generic one stop center for a wide range of products and services, with good categorisation
  - Good user feedback system and merchant screening/security
  - Search also supports location and price filtering, and also product specific details (for example, in TVs & Entertainment Systems, one can select the brand, screen size, screen tech, TV features)
  - Search bar is highly visible, and provides suggestions by helping to complete searches
  - Organised home page with all the categories visible, and also recent listings
  - Listing page is simple and informative: able to view reviews on sellers, price, location, delivery and payment options in a single glance. Similar or related listings are also displayed below, reducing effort required by the user
  - Listing process is intuitive: drag and drop photos of the item, select a category and fill in the fields (title, item condition, price, description, deal method, payment method) accordingly.
- Cons
  - The number of different subcategories may overwhelm the user
  - Generic selling and rental platform, not catered to 3d printing services i.e. does not support specific functions such as file upload and print orientation, generic filter lacks filament, other settings option specification

Overall, Carousell is an excellent platform with high learnability and efficiency. Users are able to pinpoint what kind of item they are looking for with the extensive search features, and the interface is simple enough for first-time users to understand and accomplish basic tasks. However, it is ultimately a generic online marketplace for all kinds of items. Since it is not designed specifically for 3D printing services, there is no streamlined process and details will need to be worked out with the seller using the chat functionality.

3D Printing Services

Zelta3D

Zelta3D is a 3d printing service for businesses, students and individuals. The interface is modern and supports uploading of various file formats. However, no direct manipulation such as drag and drop is supported.

Source: https://www.zelta3d.com/

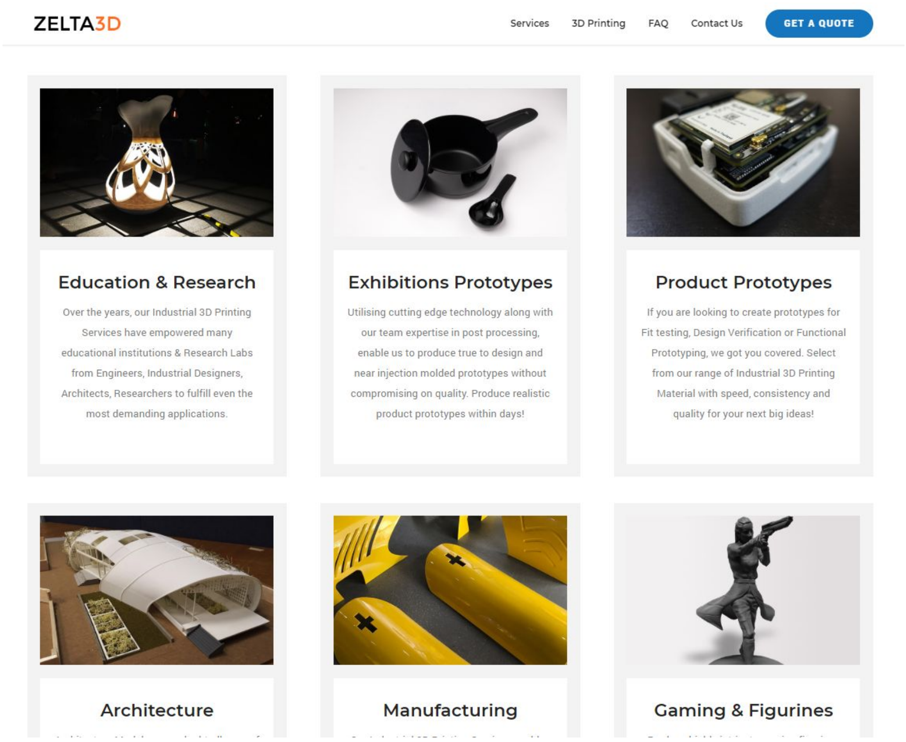


Figure 2: Zelta3D Product Quotation Page

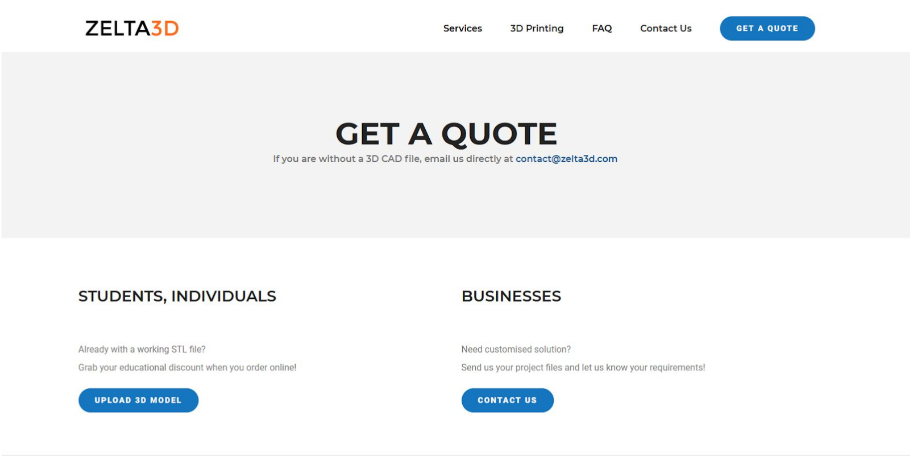


Figure 3: Zelta3D Quotation for Various Businesses

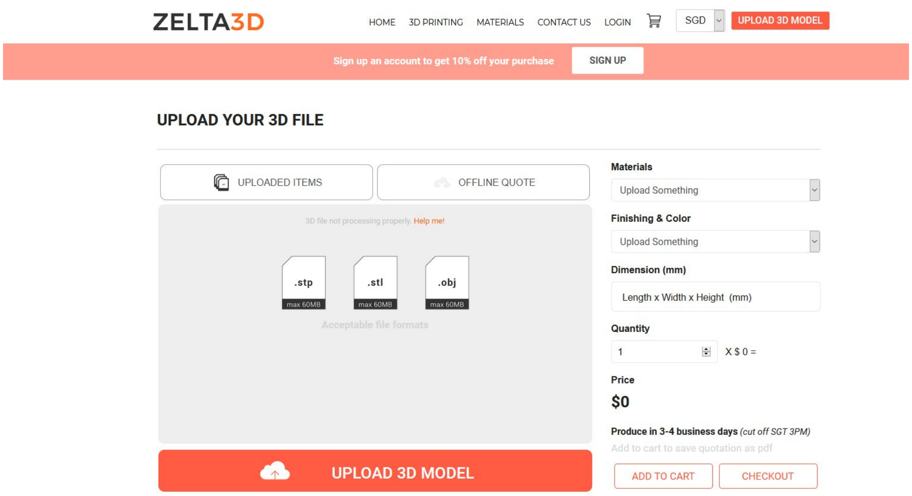


Figure 4: Zelta3D Upload Model Page

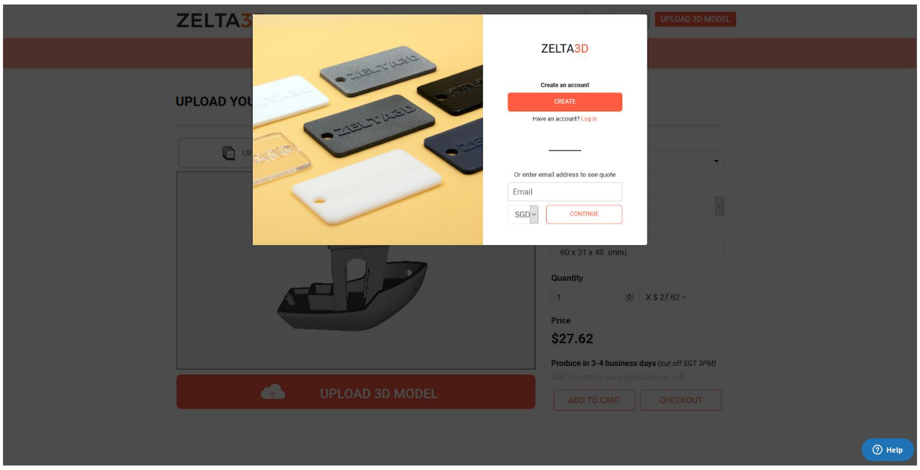


Figure 5: Zelta3D Forces Users to Create Accounts to Get Quotation

Evaluation

- Pros
  - Designed specifically for 3D printing jobs (e.g. file upload functions and 3d print specific filtering options).
  - Covers a range of use cases (i.e. manufacturing, product prototypes etc.) with well-defined categorisation.
  - High level customisation options such as material, finishing and colour.
  - Live price quoting and estimation of delivery.
  - Account stores shipping information and order history, making form fill-in more efficient.
  - Visualisation of the uploaded file and dimension to aid user confirmation and make the process more satisfying.
- Cons
  - Not open marketplace, only one provider and thus,
    - Prices are not competitive
    - Does not help owners maximise utilisation of private resources
  - Users are forced to create an account after uploading a .stl file, and cannot get a quote without doing so. This adds friction to the process.

- File upload does not support drag and drop (must select upload file button) which is an expected feature from users' mental models.
- Low scannability. Users cannot get a high-level idea of the website's structure with just a glance.

Zelta3D provides a satisfying experience for users in terms of the wide range of options and freedom of customisation as expected of a professional 3D printing service provider. However, there are many ways in which the interface could be further improved, such as creating a more seamless navigation experience, reducing friction in the quotation process, and increasing scannability by revamping the visual structure of the homepage.

Rental of Power Tools

Home Fix

Home fix is a DIY hardware store that sells and rents power tools. It's rental page is really comprehensive and allows the user to customise rental orders.
Source: https://home-fix.com/

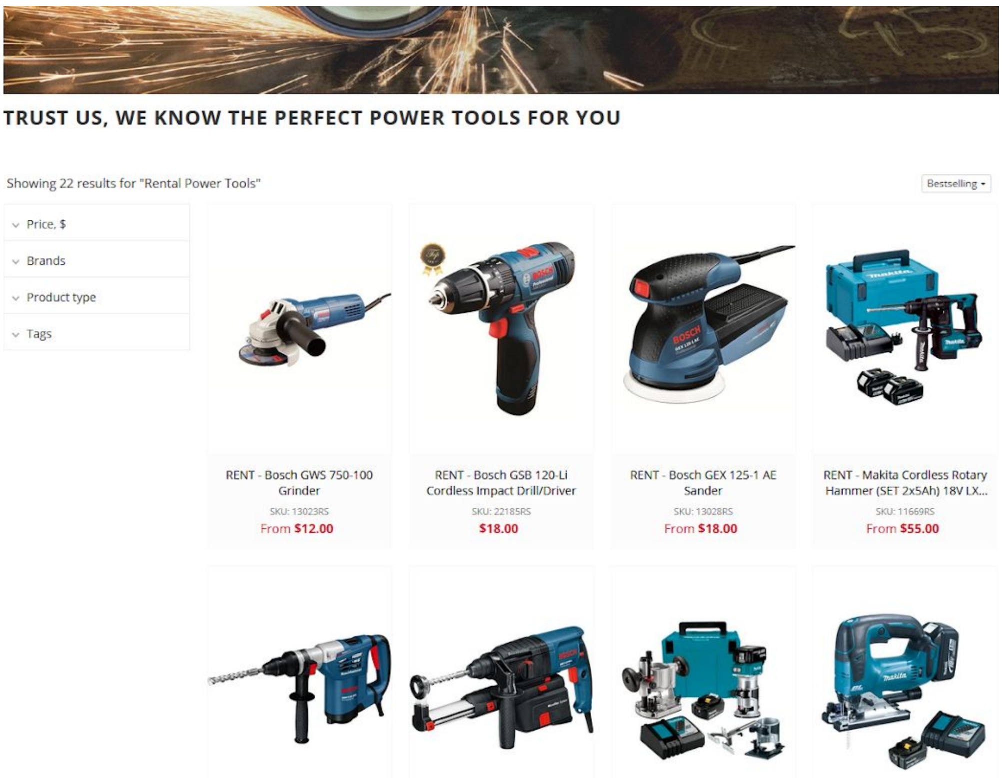


Figure 6: HomeFix Product Rental Page

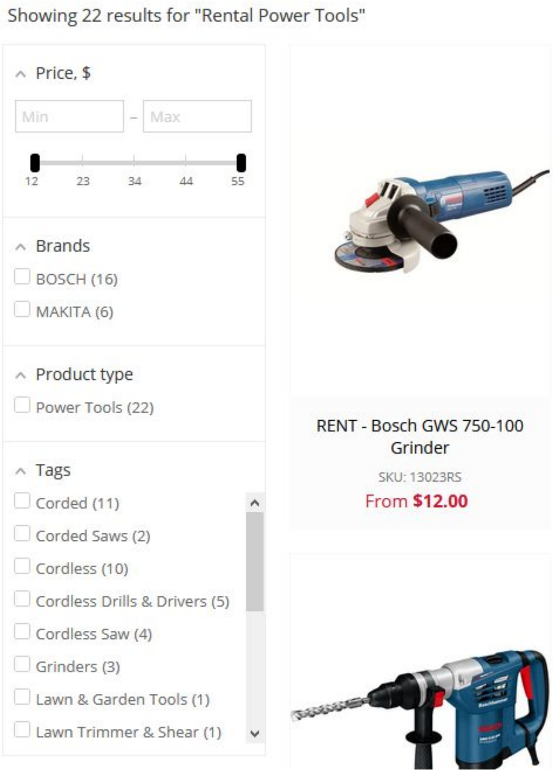


Figure 7: HomeFix Item Filter Options

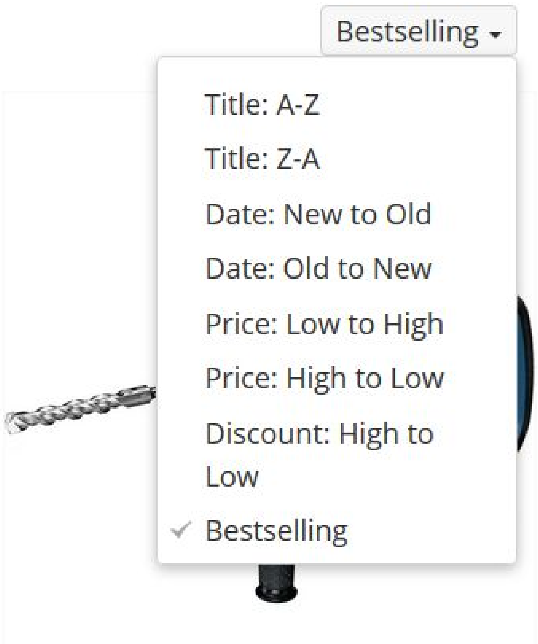


Figure 8: Sorting Options

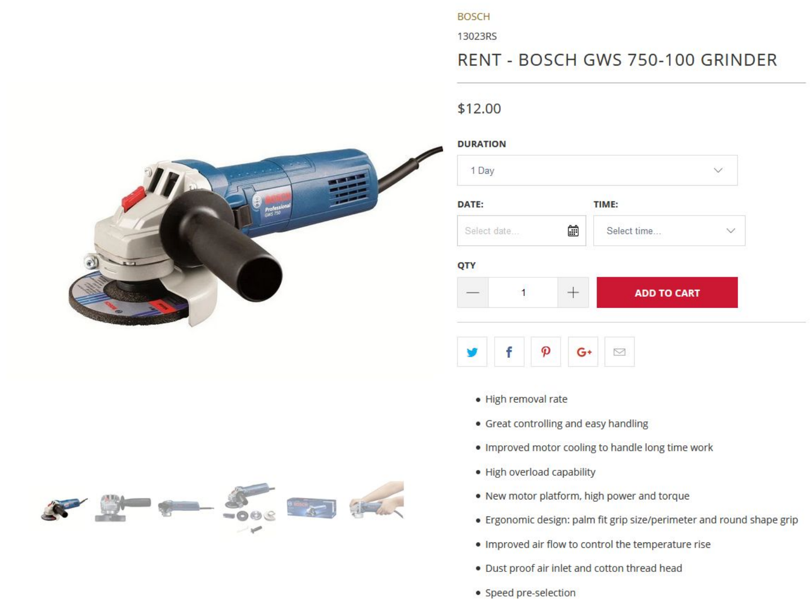


Figure 9: HomeFix Item Renting Page

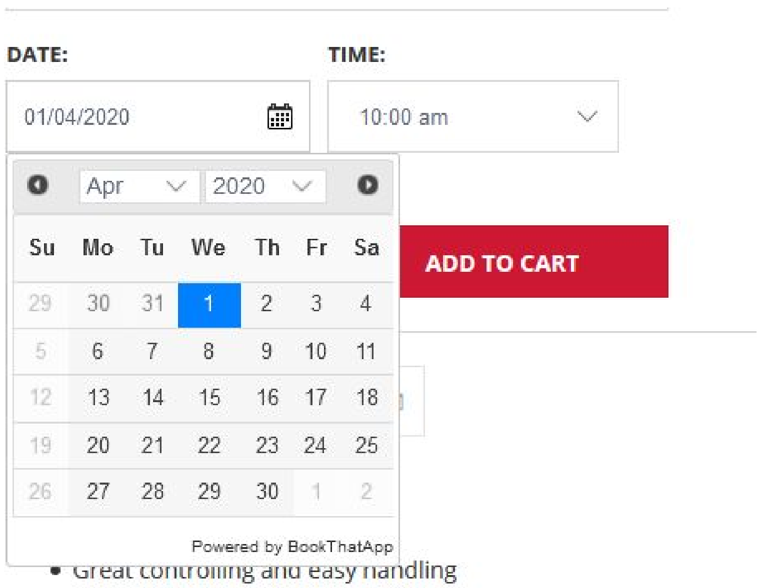


Figure 10: HomeFix Item Duration Selection

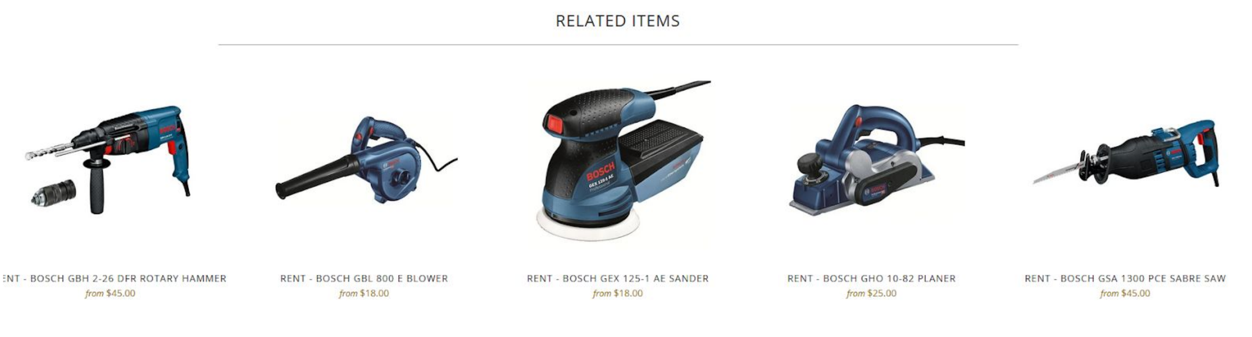


Figure 11: HomeFix Suggested Items

Evaluation

- Pros
    - Wide range of rental equipment
    - Efficient use of form-fill-in for the selection of dates which the item is available. On selecting an item, we are presented with a menu that shows the product's information. Clicking on the calendar icon brings up the calendar. Dates that have passed or are too near the current date are blocked out (user is unable to click on those dates)
    - Sort and filter options are intuitive and fits most users' mental models
    - Reviews are available for users to gauge the quality of the tool
    - The user is also presented with related items available for rent
- Cons
    - Lacks fields where user can contact lender (such as inquiry forms)
    - Only allows a fixed duration of rental (i.e. 1 day or 3 days)

Overall, HomeFix provides a clean and efficient interface for finding products and renting them. By conforming to users' mental models, it reduces the likelihood of users committing mistakes. By guiding the user via pre-defined rules in the form fill-in interaction style, it makes the renting process quick and easy for the user.

Design challenges

Some of the possible design challenges that we foresee are:

1. Huge variation in user skill level. For example, some users may not be as tech-savvy as the others, such as older users or beginners. Meanwhile, others may be experts in the field and want to be able to see all the technical details of the equipment provided.
   Hence, our platform should ideally be able to cater to users from a range of expertise.

2. Based on the literature review, there is currently no existing platform that can cover our entire problem scope. Hence, we looked into different web applications that can solve a different part of our scope (i.e. 3D printing, rental, and online marketplace). It will be a challenge to integrate all these separate functions into a single website, while also ensuring usability and adhering to the design principles.
   Thus, we will need to explore more in our ideation/design phase and collect sufficient user testing data to cherry-pick the best features from each of these existing platforms to be integrated into our design.

3. 3D prints are highly customisable, however, as we are not avid users of 3D printers ourselves, we may fail to identify some features.
   However, this can be easily solved with more in-depth research and interviews/surveys with experienced users. Moreover, any features that we may neglect to include in our design would probably be extremely niche and not frequently used, hence can be handled as unique cases.

4. Due to time constraints, we may not be able to sufficiently test and include all the functionalities in the final prototype.
   Thus, we intend to prioritise the more significant features and follow our carefully planned schedule to ensure that we implement all our desired features.

Design Direction

Interaction Platform

In the scoping phase of our project, the team has explored different interaction platforms, namely via smartphone or desktop.

We decided to first focus on a web platform that will be used primarily on a desktop. This is because our target users will mostly be using Computer-aided Design (CAD) software on desktop to create the 3D models which will then be saved as a .stl file. The transfer of 3D models for printing is via .stl files. Thus, it is highly probable that the users will have these .stl files on their computers. Having a desktop website will allow users to easily access and upload the relevant files, and allow them to open up other CAD software to make quick changes to the modeling parameters. Additionally, a desktop website is in landscape orientation which offers sufficient space for content organisation, viewing of 3D models, and for displaying product information.

While a mobile application would be more convenient for checking messages between clients and owners, it is limited in screen size and processing power. It would thus be difficult for users to maneuver and easily view their 3D models, especially with the precision they may be used to by using a keyboard and mouse on desktop. Additionally, it is inconvenient for users to access their .stl files on mobile.

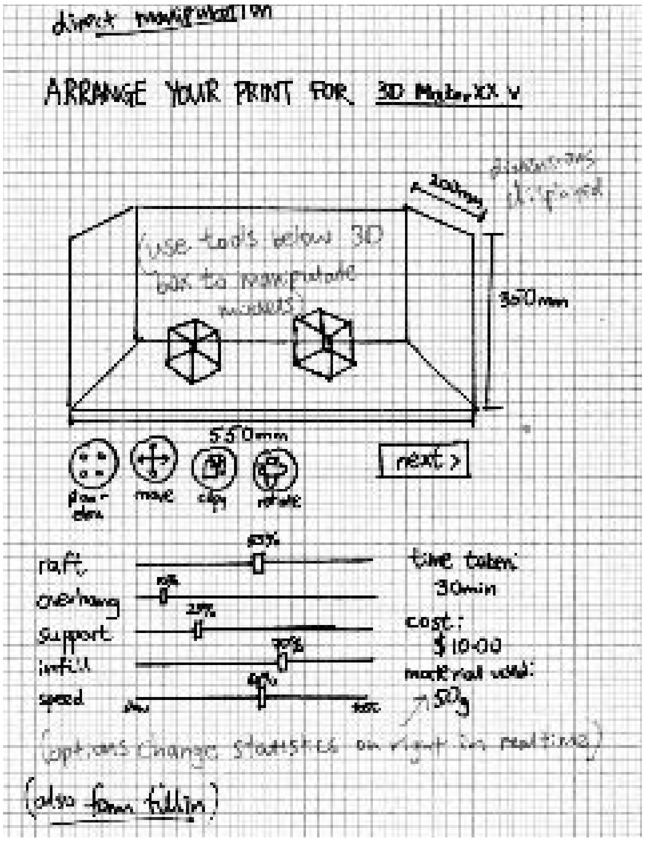
Based on the above considerations, the team will focus on designing the interface for a web platform in this project.

Interaction Styles

Next, it is important for the team to explore the various interaction styles for the users to communicate with the platform. Choosing appropriate interaction styles can help to promote usability of the application. Out of the five interaction styles, our team believes that the direct manipulation, menu selection and form fill-in styles will be highly relevant to our project.

Some initial design ideas for the 3 interaction styles identified above are given below. These are rough sketches of interaction scenarios in isolation.

Direct Manipulation



The most significant use of direct manipulation is in the pre-processing of imported models before being sent to the printer. In a traditional desktop slicer[3] application it is possible to move and rotate the imported model around a virtual representation of the physical print bed of the 3D printer, create duplicates of the model, adjust print parameters like speed, infill, raft etc[4]. Our application will allow users to apply their existing knowledge of other slicer applications.

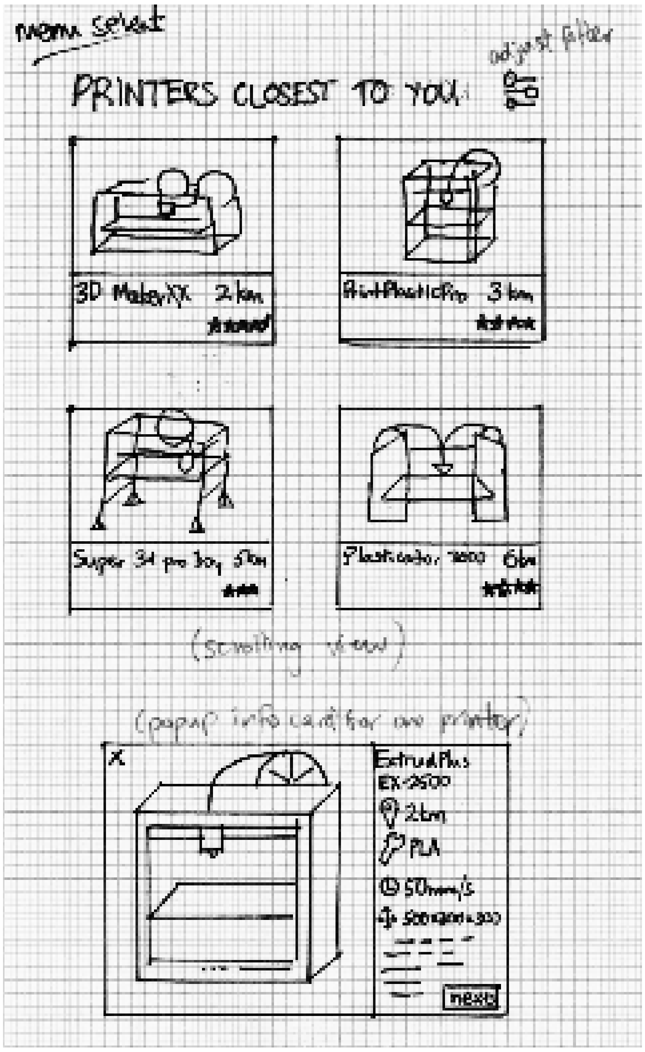
Since our application connects the user to many types of printers, the dimensions of the print area will be indicated alongside the visual representation of the area. It will also estimate in real-time the time taken for the print, the amount of material used, as well as the cost (as a function of the time taken and material used). This will give users instant feedback on the impact of their parameter choices.

The view of the print area here is a perspective view from the front, which novice users may find easiest to use. Expert users may prefer a "4-up" view consisting of plan, elevation, section, and perspective. It is harder to have a clear idea of where the models are placed, but allows for more precise placement. Switching between the two can be a way of providing different experiences for these two classes of users.

[3] The "slicer" converts STL files to movement instructions for the printer also known as "G-code". Printers do not understand the 3D model and only operate at the level of G-code. The slicer interprets the 3D model in the 3D space of the print area and converts it to low-level instructions specific to the printer ("move the print head to (x,y)", "lower the print bed by x mm", etc.)

[4] Slicers also allow the user to control print parameters like infill (how much material to print in non-visible enclosed areas), raft (how much material to lay down around the printed object before beginning), etc.

Menu Selection

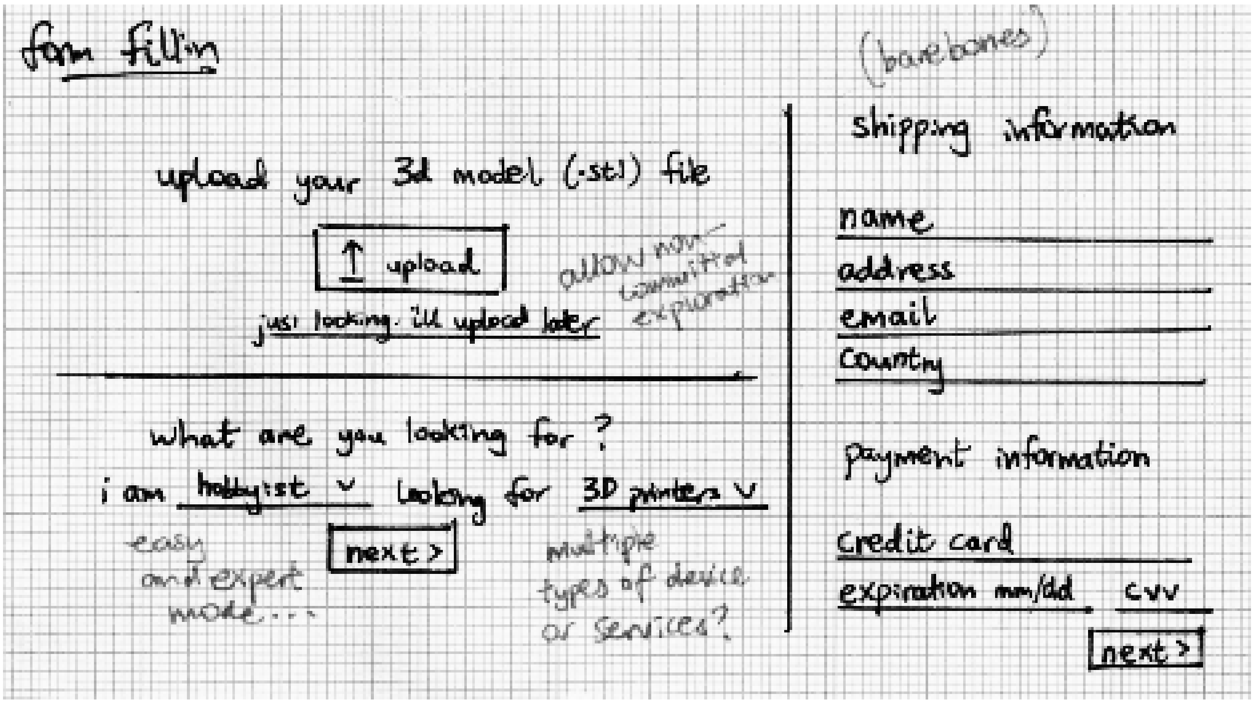


An icon menu selection will be used to select a printer before proceeding to pre-processing. The filter and sorting criteria can be adjusted. The selection screen for this is not shown, but it can use form fill-in. The menu here is made up of tiles containing visual representations of the printers available. Within a tile, a picture of the printer is prominently shown, followed by details like the name, distance from the current user, and star rating. The screen scrolls to expose other choices that the user may be interested in but are not in the first few choices.

When a tile is selected, a new screen appears with more detailed information about the printer like material type and print speed. From there, the user can proceed to pre-processing.

Potential sorting and filtering options include distance, star rating, print area dimensions, material, etc.

Form Fill-in



Form fill-in is used to gather information in a structured way. In the top left of the sketch, the initial step of uploading a 3D model file is a type of form with just one input, the file to upload. Users can skip this step if they just want to browse the selection of printers available.

If we want to support multiple types of devices in future, a possible approach is to use a simple form like in the bottom left. We ask the user to identify themselves as a hobbyist (novice) or enthusiast (expert), then the type of service they are looking for. Then we can direct the user to the appropriate user flow based on their response. The novice interface can have accommodations like restricted options to prevent errors, more instructions, or even a tutorial. The expert interface would default to the "4-up" view of the print area described previously, allow the user full control over options even if that may be error-prone, etc.

A more traditional form fill-in experience is shown on the right. We collect shipping and payment information by having users fill in the form with labels corresponding to text entry fields. We could save this information between prints[5] to make the user experience smoother, since this kind of information rarely changes.

Others

The two interaction styles excluded are command language and natural language.

While the command language interaction style is suitable for expert frequent users who prefer fine control and execution speed, our target users include beginner makers as well. Thus, it is of importance to cater our platform to this group of users too and not incorporate this interaction style which would make usage of the platform confusing for them. In addition, users of web applications generally expect a visual experience, not a command language-based one.

[5] In real life, there would be a host of data compliance issues associated with this, but we are concerned only with the user experience.

The natural language interaction style will also not be used in this project because the functions available in the platform are generally more complex than those commonly used with this interaction style. Thus, interaction with the platform via spoken commands appears to add more complexity and would thus reduce usability of the application.

Design Guidelines

In our interface design, we plan to adhere to the ten usability heuristics (Nielsen, 1994). We have listed down some of the more relevant heuristics and the features we can potentially include to match these heuristics.

1. Visibility of system status
    a. Our application should communicate the current system state to the user via appropriate feedback. This allows the users to feel in control and lead to better decision making.
    b. The feedback can come in the form of:
        i. Animated loading icons to reassure users that the wait is normal.
        ii. A check next to a selected option to communicate that the system has registered the selection. This would be useful when the user is selecting certain filter options for their search.
        iii. Changing the print parameters causes an immediate change in print statistics (estimated time and cost).

2. Consistency and standards
    a. Our application should not keep the users guessing whether different symbols or actions mean the same thing. Hence, we should follow platform conventions and ensure that the user interface is predictable and consistent.
    b. For example, if a solid blue rectangle is a clickable button on one page, the design of the other pages should be consistent to this and not use solid blue rectangles for purposes other than a button (or a dynamic action).

3. Error prevention
    a. In the worst case, errors in most applications may result in lost work. In our particular application, an erroneous input may actually cost the user real time and money. Therefore it is especially important to prevent errors before the user commits them and ends up paying for them.
    b. Real-time visualisation of the printed model in the print area will help to prevent errors arising from selection of the wrong model or settings. If the user uploads the wrong model, they are able to back out and upload the correct one. If the user selects the wrong support or raft setting they should be able to see the effects on the visualisation immediately and adjust accordingly.
    c. The wrong infill or speed setting could result in an unacceptable print while not being readily visible in the visualisation. It is not possible for our application to predict the correct infill or speed for every print, since these are dependent on various user needs that we are not aware of like their time or structural strength requirement. We can highlight extreme values of infill or speed that could result in an abnormally weak or slow print and ask the user to confirm these values and their estimated impact on time and cost before continuing.

4. Aesthetic and minimalist design
    a. Our application should remove any unnecessary elements and aim to maximise the signal-to-noise ratio. This would promote efficient communication of information through the design thus allowing users to complete their tasks faster.

5. Help and documentation
    a. Our application should provide user assistance on the usage of the system. The information should be easy to search and concrete steps to be carried out should be listed.
    b. For example, we can include application onboarding pages to help ease the users into our platform and give them detailed instructions to the different tasks they might want to perform.

In addition to the ten usability heuristics, the team plans to develop heuristics that are specific to the category of our interface.

1. Scannability of the screen
    a. Users should be able to understand our site's structure at a glance. By understanding how users scan the screen and putting what users need into the most visible zones, it allows the users to complete their tasks quickly, reduce errors, and understand the navigation of the website better.
    b. For example, in an e-commerce website, the search functionality has to be instantly visible, along with navigation as the goal of the user is to find and purchase a suitable product.
2. Frictionless user experience
    a. Users should have a friction-free experience navigating the website to find the product they are looking for and take action (purchase the service).
    b. For example, there should be a top level of navigation to show a set of well-defined categories that the site offers, along with an omnipresent product search so users can easily find what they are looking for.
    c. The renting/checkout process should be linear so as to not leave users confused or intimidated. Having to set a preferred shipping address, or creating an account during the checkout flow would contradict the user's mental model and make them think that the website has an error.

Implementation Plan

For this project, we will adopt an iterative design process to explore more designs that can iteratively better accommodate user needs and constraints and uncover UI flaws in early stages of the project. As we are not implementing a deployable product, our project development does not have to be deployment driven and thus an agile development style is not necessary in the context of this project. We plan to perform 3 iterations of the design process.

Project Schedule

Week	4	5	6	7	8	9	10	11	12	13
Epic	Scoping		Mid Term Assessment	Product Development						Final Assessment
Sub-tasks	Problem Exploration	Problem Scoping	Project Planning	Iteration 1	Iteration 2	Iteration 3			Fine tuning	
Breakdown			Ideation	R1 D1 M1	T1 R2 D2	M2 T2 R3	D3 M3	T3		
Other Submissions								Video	Report	

R	UI Requirements
D	Design
M	Implementation
T	Testing and Evaluation

Phase Plan

The various phases in product development will proceed as follows:

Phase	Description
R	**Action** We will gather UI requirements through surveys and interviews. Following that, we will host focus groups to facilitate focus group discussion and consolidate the requirements and pain points of using the existing applications. **Allocation** We will first collate a list individually then discuss it as a group to make a finalised list. This is because one person is unlikely to capture all aspects of the problem, different people identify different problems. Hence doing it in such a manner will result in a more comprehensive evaluation of requirements.
D	**Action** In the ideation phase, we will define a set of scenarios and personas to guide our design process to determine the core features and additional functions of the application. Then, we will each make a paper sketch prototype based on the scenarios. To encourage more creative idea generation, we will use the collaborative sketching method. This will also encourage less vocal members in the group to contribute in the design process. In the first iteration, we will focus on ideation and exploring more varied design ideas using low fidelity prototypes. We will explore high level conceptual designs that cover the core features and options through brainstorming and using paper sketches to draft ideas of low-fidelity prototypes. The prototypes will have low breadth and depth, covering only the core features and limited degree of functionality.

	In the second iteration, we will streamline our designs and develop designs that have a higher fidelity than in the previous iteration. The designs will have more breadth, covering both core and additional features. The third iteration should simulate how the completed application would work, with all its features and options implemented. **Allocation** We will split the team into two, one to explore design features using scenarios and another to explore through personas. We will collate the list of features from both subgroups then do the collaborative sketching method as a whole.
M	**Action** In the initial iterations, we will implement our designs using low fidelity paper prototypes. Next, we will make a high fidelity computer prototype using Figma. The prototype should allow users to be able to click on options and navigate between pages, and will thus have a better look and feel than the paper prototype. However, as no coding is involved, the information displayed is static and merely involves transitions between pages. Finally, if time permits, we will implement the prototype via HTML programming. **Allocation** For low fidelity paper prototypes, we will have different members craft different features of the design. (e.g. Ashlyn will implement filtering of product listings, Celine will implement rental period filtering, …) We will distribute the work for high fidelity computer prototypes similarly. Figma is a web-based interface design tool that allows for collaborative development.
T	**Action** In the initial iterations, we will use “wizard-of-oz” technique to simulate selection of choices and page navigation for testing purposes. In subsequent iterations, Figma supports selection of choices and page navigation. **Allocation** For the “wizard-of-oz” technique, we will split the team into two subgroups to allow concurrent testing with users. Each subgroup will have at least one ‘wizard’ to control the changes in UI to fake the interaction with user and one observer to take notes on user interaction. For subsequent iterations, we can have 1-2 observers for each user.
E	We will evaluate our designs following the evaluation plan discussed in detail below.

Evaluation Plan

To evaluate the user interface during the iterative design process, a heuristic evaluation and cognitive walkthrough will be conducted with the existing team members. After which, the team will perform usability testing to evaluate the design decisions against a representative set of users to test if the team's assumptions are correct.

Heuristic Evaluation

In addition to the ten usability heuristics, the team plans to develop heuristics that are specific to the category of our interface.

For each session, there will be 4 evaluators and 1 observer. Each evaluator is to inspect the interface alone and compare with the usability heuristics, verbalising their comments to the observer. The evaluator should explain why they don't like something with reference to the usability heuristics, rate the severity of the problem, and offer possible solutions and their trade-offs. The observer's role is to take notes and also to assist the evaluators in operating or explaining the interface especially for the paper prototype. The observer records down the comments and can prompt the evaluator for their explanation, severity rating and possible solutions, but does not have to interpret the evaluator's actions.

At the end of the heuristic evaluation, the observer will aggregate the ratings and discuss with the rest of the team about possible changes to address the usability problems identified in the design according to most frequent or severe.

Cognitive Walkthrough

To improve the learnability of our system, cognitive walkthrough will be employed to study the first experience of new users. The team will take on the perspective of a new user to evaluate the interface.

Steps

1. Create tasks based on frequency, importance and coverage of interface and break the tasks down into simple processes (click sign-up button, enter name, etc.)
2. Each team member will assess each action according to the four questions:
    a. Will the user try and achieve the right outcome?
    b. Will the user notice that the correct action is available to them?
    c. Will the user associate the correct action with the outcome they expect to achieve?
    d. If the correct action is performed; will the user see that progress is being made towards their intended outcome?
3. Record the step in the process where an issue was found, and consolidate.
4. Prioritise which issues to fix.

Usability Testing

Test participants will be recruited to perform a thinking aloud test, where they are given representative tasks to perform while continuously verbalising their thoughts as they are doing it. This will allow the team to understand what users really think about the design and what misconceptions they may have. To recruit participants, we will reach out to students in SUTD from freshmore up to seniors to capture a range of expertise. We aim to have at least 20 participants.

Test plan

1. Establish scope of usability test (test scenarios). Some possible tasks could include account creation, navigation, or e-commerce flow.
2. Preparation of location, schedule and equipment. The team will book a meeting room, ensure sufficient buffer time between tests to allow for discussion, and prepare tools for recording.
3. Prepare a script to facilitate the test and ensure consistency.
4. During the test, one facilitator refers to the script to walk users through the test while two or three observers record the participant's reactions.
5. Analyse findings and patterns.

Conclusion

Tinker is an online marketplace and a platform to match makers who need to use fabrication equipment to makers who own them. This application aims to tackle the problems of makers finding difficulty in accessing fabrication equipment and underutilisation of such equipment by makers who do own them. It takes into account the different user interface concepts and guidelines. In addition, the team plans to go through an iterative design process to achieve usability for the intended users.

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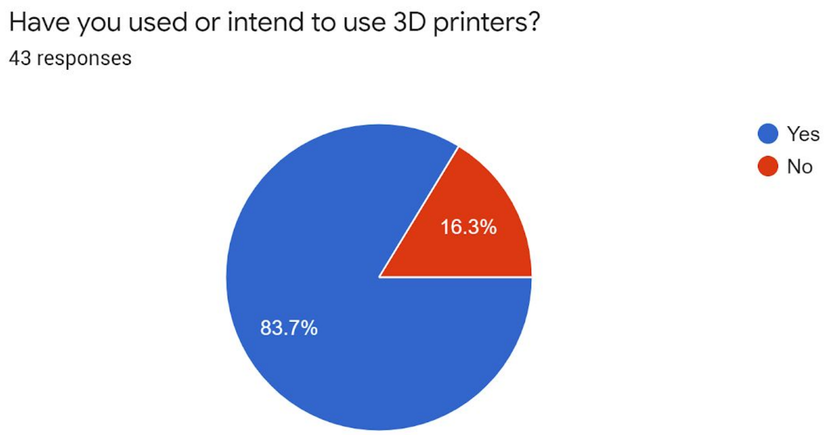
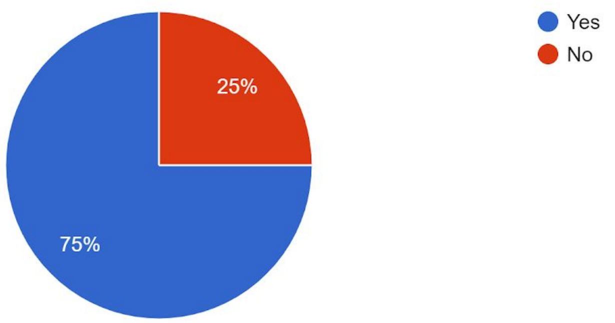
Appendix A — Survey

We carried out an online survey via Google Forms in order to better understand the problem of inaccessibility to fabrication equipment for makers. Thus, the online survey was circulated among engineers from freshmore up to seniors to gather their experience with the described problem.

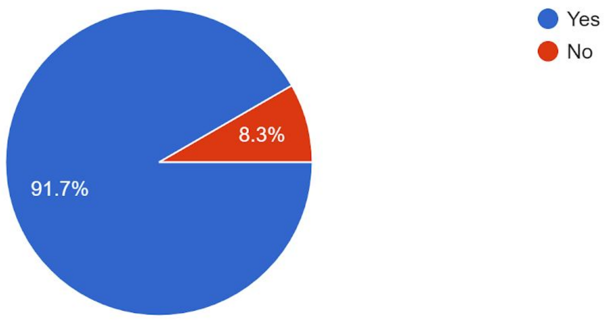
We gathered a total of 43 responses.



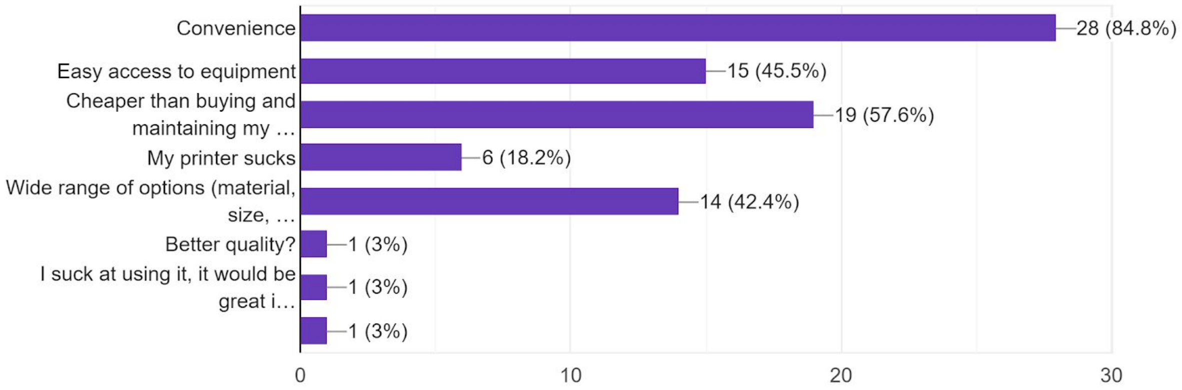
Have you experienced difficulty in accessing 3D printers?
36 responses



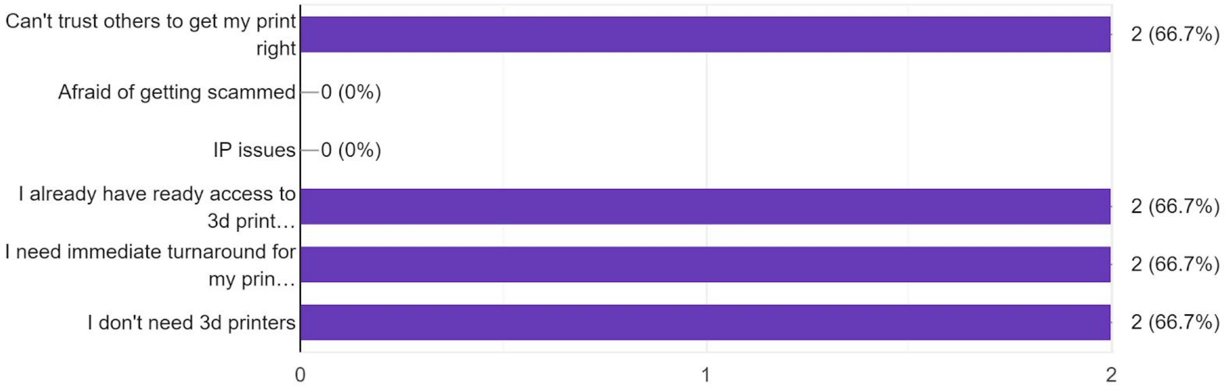
Would you be interested in a peer-to-peer fabrication service? (make your 3d prints on someone else's underutilised equipment for a fee)
36 responses



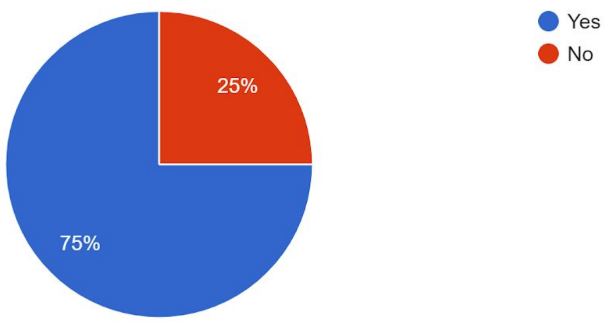
If yes, why?
33 responses



If no, why?
3 responses



Would you trust the owner of the 3d printer to arrange your 3d model on the printer bed, set up infill, raft etc options?
36 responses



Would you trust a professional 3rd party hired by the fabrication service to set up your model?
36 responses