

Human Computer Interaction

Project Plan

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CS3821 – Final Year Project

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Abstract Description

HCI is the study of how users and systems interact through user interfaces and how to make these interfaces more efficient and intuitive. User interfaces are incredibly important to creation of a system, as they act as bridge, allowing the functionality of a system to be accessed. However, it is an area that is often overlooked in the pursuit of more functionality and spending less resources translating it for use, which can result in an increase in human error and interfaces being avoided altogether. To avoid this happening, it is essential that system usability is balanced against functionality to make sure that they remain easy to use and accessible by all.

One example where this balance was not implemented in a particularly safety-critical system was the Hawaii missile alert in 2018, where a false alert was sent to residents that a missile strike was imminent, which resulted in widespread panic and fear in residents. A more commercial example was the windows 8 operating system which focussed more on touchscreen devices that lead to creating such a poor interface, that the operating system failed and all the extra functionality that was designed, could not be discovered due to the reputation that was placed on the interface.

The first incident show how important it is to spend resources carefully designing interfaces as they can have life and death implications. In a world where all our lives are becoming more and more reliant on technology, making it easy to use should be the priority for companies. And this can have business implications as well, if users can't access functionality, they will not use those products. Seeing all these incidents in real time is what gives me the motivation to do this project and how interfaces are such a vital part of systems that are often neglected that can have wide ranging implications for society and businesses themselves.

By doing this project I aim to understand the balance of functionality and usability when creating these interfaces but at the same time still make them visually appealing and interactive for users. I also want to learn and apply as much of HCI theory as I can for example using colour schemes that appear in nature, using clear hierarchies and reducing visual loads. The final aim of the project is to develop interfaces that are accessible for all types of users including those who are colour blind, motor disabilities, fully blind/deaf etc and ensure they can have an equally efficient experience. By addressing these objectives, this project aims to create technology that serves all users and addresses or even advances HCI principles.

The first interface I will be designing as part of this project will be a finance tracker that outputs a database table, so that users can interact with their financial data. I aim to provide a clear and good-looking interface that highlights key expenditures and data using aesthetic colour combinations. The tracker will present financial information such as: Income, expenditures, taxes, and account balances, so that users can control and keep track of their finances using a single point. It will allow users to filter monthly or yearly and will allow them to see their finances in multiple ways such as bar charts, line graphs, pie charts etc. I also want users to be able to see expense predictions, so that users can see how much their lifestyles truly costs over a certain period.

As this is a UI project, I will not focus too much on the backend and database and will only use the framework Springboot if I need a server-side to add extra functionality and to make communicating back and forth easier, with my Postgres database. Otherwise, I will be using HTML, JavaScript and CSS to handle the client side, and will use libraries like bootstrap, which help improve the aesthetics of the finance tracker so that I can create a stylish design.

The second interface which will take the most time (done in term 2) will be a project management and productivity application that will allow an individual to organise their tasks and projects as tasks

on a board. The application will have a large amount of functionality allowing users to create new projects, where it will store custom lists with cards with information. The card tasks will have clear input fields for tasks name, descriptions, due dates, and a colour scheme for priority levels. Users will have the flexibility to reorder these cards using drag and drop functionality and move to different lists such as when they're in progress or completed. Cards will have clear icons for all the functionality with them and will allow them to be accessed and edited.

As this interface is quite functionality based, I am aiming to develop this application use javafx as it allows me to create a rich user interface efficiently using drag and drop elements that have been created already. I can also integrate this with java so that it can act as a controller and handle inputs from a user to create the desired results and overall create a single file packaged GUI.

The third interface I will designing will be a shopping website for tennis athletes. It is a niche market but will be an interesting UI to design with the amount of different clothing items and sporting equipment that can be sold towards them. It will have a long home page that features the wide range of products that are sold and then easy to use navigation at the top of the page to view certain products like rackets or shoes etc including a search bar to look for even more specific results. The website will also have secure payment systems such a PayPal and MasterCard to make it as easy as possible.

To make this interface I will be using similar technologies that were used in the first interface as I have quite a bit of experience with them, and they work well for multiple purposes.

Timeline

For my project I have 3 UI's that need to be designed, instead of balancing 3 at once I am going to work on one at a time, with the finance tracker being the first UI I will create. By following this I hope to finish all 3 UI's around the middle of term 2, so that I can focus on my reports and manuals for the rest of that term.

Term 1

- Week 1 (25/9/23)
 - Study different frameworks and libraries, that make designing UI's more efficient and simpler for all 3 UI's
 - Research HCI principles for designing UI's e.g Colour theory, Golden ratio, Rule of thirds etc
- Week 2
 - Carry on HCI research such as ways that user are impacted by design choices and how to implement them more naturally (Will carry on for the whole term as I design interfaces)
 - Sketch designs for all 3 UI's with more emphasis on the finance tracker as that will be implemented first
 - Begin early implementation of finance tracker, experimenting with researched libraries and frameworks for hosting the web site and create database with data to be outputted
- Week 3

- Create different ways to show data e.g Pie graph, bar chart, line graph etc and create a good-looking way to switch between them
- Include a way to input or change the data and have graphs update with this
- Research on different colour schemes that are found in nature and why work well for certain reasons
- Week 4
 - Finish up design of finance tracker fixing any bugs and having other users give me feedback on the application/website
 - Review sketches and plan for shopping website and make changes to which technologies I will be using if needed
 - Write notes about the creation of finance tracker while it is fresh in my mind and added final sketches (notes about changes)
- Week 5
 - Start early design of main shopping website, implementing background colours and navigation icons and buttons
 - Look for copyright free images that can be used to show off items
 - Research about visual clutter and the best ways to organise pages with many images
- Week 6
 - Add functionality to navigation buttons and begin working on extra pages like help pages, or basket
 - Added images to main page and add sections for each item, separated by titles
 - Read different articles about best way to set up seamless navigation
- Week 7
 - Begin cleaning up what has been done so far for both website and finance tracker if needed
 - Add any changes that can be done in a short period of time etc Change text sizes, horizontal scrolling images, fix any errors
 - Add notes about shopping website to the report I started in week 4
- Week 8 – 10
 - Prepare for interim review by creating presentation that will be delivered on 1st of December
 - Translate report from notes to correct English and finish up sections that were only half completed (by adding images, extra text, conclusions)

In the holidays I want to finish shopping website and sort the plan for notes GUI application, studying technologies (Javafx) and more HCI principals to make sure I can create the final advanced interface correctly.

Term 2

- Week 1
 - Start implementing education notes GUI, by adding start menu, option to create cards and different customisation for application
 - Learn about HCI patterns from looking at many different GUI examples
- Week 2
 - Work out how to create List of cards and implement this

- Add icons and functionality for deleting cards and list
- Apply research about colour and HCI rules while adding essential features
- Week 3
 - Add option for having multiple boards of lists and not just one
 - Implement option to move cards from list to list
 - Read about accessibility while using GUI and plan how I will implement this
- Week 4
 - Focus more on styling and UI design and clean up the app to create a good looking interface
 - Get other users to review application and provide feedback
 - Add accessibility features that were planned
- Week 5
 - Work on feedback given and finish up application
 - Start writing up user manual while design is fresh in my mind
 - Start comparing all 3 interfaces as preview of report due for final supervisor meeting
- Week 6
 - Start writing report section about the software engineering processes in creating the UI's
- Week 7
 - Fix any interface issues that arise when analysing them
 - Add more user customization options if possible and improve general look of application
 - Continue with report
- Week 8-10
 - Create final presentation
 - Finish final report

Risk Assessment

1 – Unable to use Javafx for this application

Impact: The final interface, which is the most advanced, is a project tracking system. It is quite a complicated interface and my experience with javafx was very limited, only using it for the SE project. If I cannot learn in the Christmas holidays how to use the technology for this purpose it will be tough to learn another language that can create a GUI application like it. And using the knowledge I have now, I would not be able to make a great looking interface with at least some functionality, which would mean I would have to start my plan from scratch again.

Risk: This has some risk as I am planning to dedicate time in the holidays to learn it, but if the other interfaces take longer to design, it may overlap with the time I need.

Mitigate: I will make good notes of the other interfaces technologies, so that I have another kind of technology I can fall back on and create a slightly different interface if needed and won't have to start the plan from the start.

2 – Technical challenges

Impact: When creating the timeline, it is planned that everything runs smoothly and that I can add the functionality without too much trouble. However, that is almost never the case as there will be some problem and this can cause my whole timeline to not fit as I would need to spend more time trying to solve the issues.

Risk: Quite likely, as I have not used all these technologies for extended period of times and never for these purposes and so there will be some problems.

Mitigate: I plan to look to my supervisor for guidance on how to deal with something not fitting right and even spending more time during my Christmas holidays to make sure everything runs how I plan for it. I am also going to that time learning the technology for the final interface as mentioned in the last risk.

3 – Hardware failure

Impact: With any project it is possible for any laptop/computer to fail at any time which would result in the whole project being lost. This would be quite bad as I would have to start again and would also mean I could not work from other systems without using a thumb drive etc.

Risk: It is impossible to rule this out as water could spill on my laptop or cpu can overheat.

Mitigate: I will store all my code on gitlab and keep all my reports on my onedrive, so that I can access both from any system and at any time. This will mean that if for some reason I can't use my laptop, I can use the university computers to complete my project.

4 – Poor execution of an Interface

Impact: I have 3 interfaces to make and so I am quite time limited, as I need to design all 3 as well as finish a large report describing how I created all 3 and the differences between. If I spend too much time on one interface it will result in me rushing to finish tasks and interfaces may not turn out as well as they could have.

Risk: It is quite possible as I may get feedback after interim submission or during one of the supervisor meetings to change a large part of an interface.

Mitigate: To prevent this I will have consistent meetings with my supervisor that he can keep track of my progress and that the work I am doing is on the right track. I will also sketch out many different designs of each interface, so that I select the most fitting one.

5 – Bad balance of functionality and usability

Impact: I may spend too much time developing extra features instead of developing usable and good-looking interfaces which is what my project is about. This will result in my supervisor telling me to redo parts of the interface, which will mean I have less time to spend on reports and I may get a lower mark.

Risk: This is quite likely, especially as the last interface is quite functionality based.

Mitigate: I will discuss all my ideas for interfaces in detail with supervisor and focus on the user of interface when designing the interface instead of just adding extra functionality.

6 – Configuration and single file issues

Impact: When building these interfaces, it will require multiple files to launch when developing, but when presenting them at university it will require me to package the project into a file. This may mean that I cannot get this work and so will take considerable time to set up at university or may not run at all without installing some software.

Risk: This is quite likely that there will be some problems due to this, as this is something that I have never done before

Mitigate: I will use online forums to solve problems and look back to last year software engineering which showed how to package a Javafx project if I need help. I will also report these problems to CIM and my supervisor.

Bibliography

1 – Dix, Alan, et al. Human-Computer Interaction. 3rd ed., Pearson, 2004

This book is a great source of foundational principles for HCI and provides a great focus on how to get the balance of functionality and usability of UI's correct and why usability needs to be a key component when building system. It also provides a large chapter on the design process and key aspects of this.

2 – Lidwell, W., Holden, K., & Bultler, J. 2010. Universal Principles of Design. Rockport Publishers

This is more general design book, but it is a great help as it provides each design principle in a very short and easy to understand manner. It has a very large number of principles and provides a few pages per principle so the user can understand and implement it by themselves.

3 – Beaudouin-Lafon, Michel. "Designing interaction, not interfaces." Proceedings of the working conference on Advanced visual interfaces. 2004.

This research paper provides a great description of how designers need to focus on interaction than solely the interface design and how the best UI's are almost invisible to the user because they're so straightforward to use. It is a bit dated but still provided a new dynamic way to designing user interfaces.

4 – Grammenos, Dimitris, Anthony Savidis, and Constantine Stephanidis. "Designing universally accessible games." *Computers in Entertainment (CIE)* 7.1 (2009): 1-29.

This research paper on developing games provides great points on the basics of interfaces that are often ignored during development. Even though it is about making games, the same points apply to making any other types of interfaces and this paper provides this in a very simplified manner.

5 – <https://www.spiceworks.com/tech/artificial-intelligence/articles/what-is-hci/>

An article on HCI that provided a great outline on why it is important, and all the users involved when designing interactive technology. Provides a few easy-to-understand goals and why they are important when designing interfaces.

6 – <https://getbootstrap.com/docs/5.3/getting-started/introduction/>

The bootstrap documentation which I will be using a library for two of my interfaces and maybe the final interface if I find my other interfaces successful. It provides very simple instructions on how to download the framework and provides a great list of its elements.

7 – <https://docs.oracle.com/javase/8/javafx/api/toc.htm>

Javafx is the technology that I will be using to make my final UI and so its documentation is a huge help to finding and understanding all the different elements that can be used. It allows me to see all available packages and classes with a single click and so is a very helpful resource.

8 – <https://edition.cnn.com/2018/01/30/us/hawaii-false-missile-alert-timeline/index.html>

This is a news article about the Hawaii missile alert that allowed me to understand the issues with that interface and how that incident occurred, showing that interfaces can have real world impacts.

9 – <https://www.pcworld.com/article/428571/a-tribute-to-windows-8-if-it-hadnt-been-so-bad-windows-10-wouldnt-be-so-good.html>

Another new article that described how windows 8 failed and how users abandoned it, which I described in my abstract description. This allowed me to understand a more commercial failure that I can relate to my own designing of interfaces.