Interim Project Report

**Full Unit – Interim Report**

A study in (HCI) human computer interaction

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A report submitted in part fulfilment of the degree of

**BSc (Hons) in Computer Science**

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Contents

[Interim Project Report 1](#_Toc157071746)

[1](#_Toc157071747)

[A study in (HCI) human computer interaction 1](#_Toc157071748)

[Ramnik Dhoot 1](#_Toc157071749)

[Introduction 5](#_Toc157071750)

[1. Abstract: 5](#_Toc157071751)

[1.1 My UI’s: 6](#_Toc157071752)

[2. Project Specifications: 7](#_Toc157071753)

[2.1 Target Audience 8](#_Toc157071754)

[3. Aims, objectives, and literature survey 10](#_Toc157071755)

[3.1 Technologies I have used and why: 10](#_Toc157071756)

[3.2 Motivation: 12](#_Toc157071757)

[3.3 HCI Goals for my Ui’s: 14](#_Toc157071758)

[4. HCI Theory 16](#_Toc157071759)

[4.1 Background Theory: 16](#_Toc157071760)

[4.2 Literature review: 19](#_Toc157071761)

[5. My Progress so far 21](#_Toc157071762)

[5.1 Work completed: 21](#_Toc157071763)

[5.2 My process of design: 24](#_Toc157071764)

[5.3 Designs and HCI principles: 25](#_Toc157071765)

[Inventory management system: 25](#_Toc157071766)

[5.3.1 Other HCI methodologies I have included in my designs: 33](#_Toc157071776)

[5.4 Software engineering: 33](#_Toc157071777)

[5.Proffesional issues 35](#_Toc157071778)

[6.Timeline with changes 36](#_Toc157071779)

[Conclusion 40](#_Toc157071780)

[Bibliography and citations 40](#_Toc157071781)

[Appendix 42](#_Toc157071782)

[Diary 42](#_Toc157071783)

Introduction

This report provides an overview of the progress that has been made on the project so far, including the aims, objectives, planning, completed work, and next steps. I will explain my progress with respect to my timeline and why I have deviated from it. The report also discusses some of the challenges that have been faced during the project and how I have overcome them. I will also talk about a lot of the theoretical knowledge of HCI I have learned and explain how it relates to my project and provide a survey of all the literature and resources I. I will show how I am applying HCI principles to my user interfaces.

This is a complex project that involves designing, creating, and testing three different user interfaces with different HCI principles. The goal of the project is to create user interfaces that are easy to use, efficient, and enjoyable for users. It is also to gain a comprehensive understanding of HCI principles and their application to the design of interactive systems by creating three user interfaces, A shopping website, an Inventory managements systems interface, and a note taking application.

The project is currently in the implementation phase. So far, I have, created the shopping websites layout, created the database and website interfaces layout for my inventory management system, and begun my notes application. Swing has also been learned and used to create a basic GUI for the note’s application as well as bootstrap to make websites. All the major research has been competed as I used this first term to focus on that then next term, I will focus in the Ui’s.

1. Abstract:

Human-computer interaction (HCI) is a very wide field that studies the design and evaluation of interactive computer systems for human use. The goal of HCI is to improve the interaction between users and computer systems by improving the methodologies and processes for designing interfaces, teaching techniques for evaluating interfaces, and developing new techniques for creating these interfaces. Human-Computer Interaction (HCI) focuses on three more major concerns; the people, the computers and that tasks that are performed. The most important aspect of HCI is understanding the user. This involves understanding the user's goals, tasks, and needs, as well as their cognitive, and physical abilities to perform their desired task, the book Human-computer interaction by Alan Dix [1] says that an interaction between a computer and user should be “seamless with respect to their everyday work”. For example, what may be simple to understand for a young person who has been accustomed to computers, may not be as usable to older people. This would be an issue of accessibility. By understanding the end-user, we can design and implement systems and processes that are easy to use and efficient and we can help facilitate effective communication between users and technology.

Some other important aspects of HCI are usability and functionality. Usability is a measure of how easy and efficient a system is to use. A usable system is one that can be learned and used quickly and easily, and one that allows users to complete their desired tasks. Functionality is the services the system provides to the user and the paper [3] explains how the value functionality is only visible when the system is efficiently utilized by the user. However, there are trade-offs with usability and functionality, for example in my interface I have had to Simplify the navigation of my website which reduces the number of clicks needed to access essential features and looks more visually appealing. While this may enhance usability, it limits the visibility or accessibility of certain advanced functions which could decrease efficiency for higher level users.

Because of this, system designers should prioritize understanding the end user's intentions and their approach to tasks. Neglecting the end user's needs can lead to many problems, potentially even endangering people’s lives. Alan Dix [1] talks about how aspects such as psychology, computer science, design, and engineering are all intertwined into HCI and how a good designer would have knowledge of the user’s skills and capabilities and can understand the users' needs, preferences, and behaviours.

In this project I will explore how crucial a systems design is and I will create 3 user interfaces using various principles and methods I have gathered from all the resources I have gone through then I will demonstrate these principles in my Ui’s. I will also talk about the hardware aspect of a computer and evaluate how usable it is regarding my project. In my final report at the end of the year I will explain the projects aims, professional issues, an evaluation of all the work I have done and the theory I have learnt about HCI.

The 3 interfaces I am creating are a shopping website using HTML, CSS, and JavaScript (web-based interface), a notepad desktop application using java and Swing (Graphical user interface), and Database Management System (DBMS) Interface using MySQL for the database and a website for a GUI. They will all have user-centred design where the user's needs, goals, and preferences are at the forefront of the design process. [2] helped me decide which interfaces I should create. I will also be conducting user testing on them while I am designing to improve my design and understand my target users’ needs better.

# 1.1 My UI’s:

For the note’s desktop application, I am using Swing which a java library that will help me make a graphical user interface. This is a new technology for me, so I have spent a week learning how to use it, I have used the swing Documentation and manual (2) and also a course on YouTube. This is targeted towards students so I will design it with principles targeted towards the 14-21 age group. It will be a simple note taking application with limited functionality but with the options you would find in a normal note’s application would all be there, for example, save, load, delete, change size and change font. It will also have images and icons to help navigate throughout the website and everything will be laid out in a way that is intuitive and suitable for users to learn and use.

The website will be a shopping website catering to users with disabilities specifically visual impairment. The website's user experience (UX) design should prioritize simplicity and ease of use as I am designing it to be used in conjunction with a screen reader. This will be designed with a commitment to accessibility encompassing elements such as semantic HTML, clear navigation, high contrast, and keyboard accessibility. I have created a simple interface which is navigated by menus, and this will evolve into a website with descriptive text, alt tags for images, and compatibility with screen readers, facilitating a seamless browsing experience. I am adhering to accessibility guidelines like WCAG, striving for at least AA compliance (13).

The Database interface will be an inventory management system using a MySQL database and html/CSS/js and react interface, targeted towards business owners who have a warehouse and need to keep inventory of their items. I will discuss why I have decided to use react later in this report. I will start the back end using java and Spring boot to interact with the database and the back end together using java’s servlet library. They will need to use it in different devices such as a phone, tablet, laptop and computer. It will also have a simple navigation design to provide an at-a-glance overview and quick access to key features. This is why I’m using bootstrap as it is responsive so it will provide better control of the layout of the website and also will make it look more visually appealing. I Have been using [7] to help me design the interfaces. It will also implement an account functionality for security, as well as defining user roles and permissions to control access levels based on the user's responsibilities.

2. Project Specifications:

Project Goal: To design and implement three user interfaces (UIs) for software applications, focusing on the UI itself. The UIs should be usable, efficient, and visually appealing.

Project Requirements:

The project has defined clear requirements to guide the development and evaluation of the user interfaces. First the UIs should cater to distinct user groups and tasks, this is so each UI can have different HCI principles in place.

The evaluation process will be robust and comprehensive. Usability, efficiency, and user satisfaction are key metrics for evaluating the overall success, emphasizing a user-centric approach. This means I need to assess how intuitive and user-friendly the interfaces are, how efficiently tasks can be completed, and ensuring that users have a positive and satisfying experience overall.

By aligning the UI design with specific the user requirements for my target users, adhering to modern software engineering principles during implementation, and evaluating the UIs using HCI principles, this project aims to deliver highly usable and effective user interfaces that enhance the overall user experience. This will include basic functionality such as writing in the notes app and being able to buy things in the shopping website.

Project Deliverables:

The project will culminate in the delivery of three implemented user interfaces: a shopping website, a notepad application, and a database management system interface. Alongside the interfaces, a comprehensive final report will be created, outlining the entire design process. This report will delve into the methodologies employed, detailing the conceptualization, prototyping, and implementation stages for each UI. It will then talk about the evaluation phase, where various HCI evaluation methods such as cognitive walkthroughs, heuristic evaluations, and model-based evaluations were applied to assess the usability and other principles of the interfaces. The report will serve as a reflective document, offering insights into the decision-making processes and showcasing how HCI principles were instrumental in shaping the final design of each UI.

Evaluation techniques:

To ensure the good usability and user-friendliness of my user interfaces, I will employ a comprehensive evaluation process using various techniques I have learned from my research. The cognitive walkthrough method will be utilized to assess the interfaces from the user's perspective, this involves an evaluator (me in this case) walking through the interface in the context of the tasks which a typical user will need to achieve. This will aid in identifying potential usability issues and ensuring that the design aligns with users' mental models. Additionally, a heuristic evaluation will be conducted which is a usability inspection method that involves me using established usability heuristics and self-designed heuristics to test the usability of user interfaces. The heuristics I will be using is Nelsen suability heuristics which I explain in my theory section. Furthermore, a model-based evaluation approach will be employed, this method uses a model of how a human would use the system to obtain predicted usability measures by simulation to analyse the interfaces' performance and interaction flow. By combining these evaluation techniques, I can thoroughly assess and enhance the overall usability, efficiency, and satisfaction of the user experience which all determine THE success of this entire project.

# 2.1 Target Audience

This section talks about the user groups of each of my UI’s and how they would interact with the systems, it also goes into how it should be designed to cater to them.

### Shopping website: Younger/older Visually Impaired Users:

Firstly a shopping website would be used by widely varying age groups so I have designed it for them all.

|  |  |  |
| --- | --- | --- |
| Younger | Older | Statistics |
| Younger visually impaired individuals are often more familiar with technology, including screen readers, magnification software, and other assistive technologies. | Older individuals may have varying levels of proficiency with technology, from those who are comfortable using assistive technologies to those who may need simpler interfaces. | Younger users exhibit high adaptability to new technology interfaces​​. Older adults face challenges such as a lack of confidence and physical difficulties in using devices​​.  [Barriers to adoption and attitudes towards tech among older Americans | Pew Research Center](https://www.pewresearch.org/internet/2017/05/17/barriers-to-adoption-and-attitudes-towards-technology/) |
| Often engage in online shopping for a variety of products, including fashion, electronics, and entertainment. | They may visit the website for essential tasks such as online shopping for daily necessities, accessing health information, and staying informed about news and events. | younger generations are heavily engaged in digital platforms for a variety of activities, but older adults are increasingly engaging online  <https://www.pewresearch.org/short-reads/2019/09/09/us-generations-technology-use/> |
| A modern and visually appealing design to resonate with the preferences of younger users. | Provide clear instructions and assistance throughout the website, especially in areas like form filling and checkout processes. | Younger people have a preference for modern and visually appealing designs, based on general trends in technology use  <https://www.pewresearch.org/short-reads/2019/09/09/us-generations-technology-use/> |
| The website should be responsive and compatible with various devices, including smartphones and tablets | Older users may also have cognitive impairments, provide clear and simple instructions, avoiding jargon, and help when needed. | 96% of those aged 18 to 29 own a smartphone​​, 61% of those 65 and older own a smartphone.  <https://www.pewresearch.org/short-reads/2022/01/13/share-of-those-65-and-older-who-are-tech-users-has-grown-in-the-past-decade/> |

Visually impaired users navigate and interact with digital content in ways that differ significantly from users without visual impairments. Their experience and interaction with technology are shaped by the necessity to rely on alternative senses and tools to access information. For instance, where a sighted user might quickly scan a webpage for information or click on a visually appealing button, a visually impaired user would depend on screen readers to read out the text content of the page, including navigation menus and alt text descriptions of images. This reliance on auditory feedback to navigate means that website layouts, menu structures, and even the choice of words used in links and buttons must be clear and logically organized.

Moreover, visually impaired users may use voice recognition software to input commands or type text, which requires my website to support voice input effectively. This can include navigating to different sections of a site, filling out forms, or performing searches. The use of refreshable braille displays also highlights a unique aspect of their interaction with digital content, allowing users to 'read' the screen through tactile feedback. This technology converts on-screen information into braille characters that can be felt with the fingers, providing a direct and tactile way to interact with text on a digital device.

Therefore, understanding these unique interaction methods and challenges is crucial for developers and designers to create more accessible and inclusive digital environments.

### Inventory management system: Entrepreneurs and Small Business Owners/ managers.

Business managers and entrepreneurs who use inventory management systems span a diverse range of business types, including retail stores, e-commerce ventures, manufacturing companies, and service providers. This diversity necessitates a system design that is intuitive and accessible to users with varying levels of technological expertise. The interface of the inventory management system plays a crucial role in this context, as it must cater to users who may not be tech-savvy. Ensuring that the system is user-friendly and straightforward allows business owners to navigate and utilize the system effectively, regardless of their prior experience with similar technologies.

Time efficiency is another critical consideration for business owners, who often find themselves multitasking and managing various aspects of their operations simultaneously. They require an inventory management system that enables them to perform tasks and access vital information swiftly. The ability to quickly update inventory levels, check stock, and place orders can significantly impact the daily operations of a business. As such, the system must be optimized for speed and efficiency, enabling entrepreneurs to manage their time more effectively.

Business owners often seek the ability to adapt the system to fit their unique business models and processes. This can range from modifying the interface to suit their preferences, to tailoring reports and analytics to better reflect their business's key performance indicators. The flexibility to adjust the system as needed allows businesses to optimize their operations and align the inventory management process with their strategic goals.

Security and privacy are paramount for business managers, especially given the sensitive nature of inventory and business data. Entrepreneurs prioritize systems that can safeguard their information against unauthorized access and breaches. This includes secure login mechanisms, data encryption, and regular security updates to protect against emerging threats. Trust in the system's security measures encourages business owners to confidently rely on it for their inventory management needs.

Lastly, scalability is an essential feature of an inventory management system for growing businesses. As companies expand, their inventory management requirements become more complex, necessitating a system that can grow with them. This includes handling an increasing volume of products, accommodating new product lines, and supporting additional users. A scalable system ensures that business owners can continue to manage their inventory effectively without the need for frequent system migrations or overhauls, facilitating smoother growth and expansion.

### Notes application: Students

Students, ranging from those in high school to those in college, have specific needs when it comes to using a notes application, primarily due to their academic focus. Younger students, for example in secondary school, are engaged in multiple different subjects at the same time. This diversity in subject matter necessitates features within the notes application that support varied study methods and content types. For instance, tools that facilitate revision, such as flashcards and summarization features, along with reminders for important dates and deadlines, would be highly valued. These functionalities help students efficiently organize their study material and manage their academic schedules.

As students progress to college and specialize in specific fields of study, their needs become more sophisticated, requiring the notes application to offer advanced features tailored to their coursework and research activities. For example, the ability to integrate multimedia elements, specialized formats for different types of data, and collaboration features for group projects.

Given that students are generally tech-savvy but may have varying attention spans, the user interface (UI) of the notes application needs to be visually engaging and intuitive. A clean, easy-to-navigate UI with clear and concise information presentation can significantly enhance usability, particularly for students who spend long hours studying and require quick access to their notes.

Personalization features also play a crucial role in improving the user experience. Allowing users to customize their interface, whether through themes, font sizes, or layout configurations, caters to individual preferences and learning styles. This level of customization not only makes the application more appealing but also can aid in the organization and retrieval of information, making study sessions more productive.

3. Aims, objectives, and literature survey

The aims of this project centre on the design and implementation of three distinct user interfaces (UIs) for software applications, with a primary focus on the UI itself. The project further seeks to evaluate these interfaces through the lens of Human-Computer Interaction (HCI) principles, with a particular emphasis on usability, efficiency, and user satisfaction. Additionally, a key objective is to cultivate a comprehensive understanding of HCI principles and their practical application in the design of interactive systems.

To achieve these aims, I have outlined these specific objectives:

1. Research HCI Principles and UI Technologies: Conduct thorough research into HCI principles and various UI technologies to establish a solid foundation for the design and implementation phases.
2. Design Three UIs for Different User Groups and Tasks: Employ the acquired knowledge to design three distinct UIs, each tailored to meet the specific needs of different user groups and tasks.
3. Implement UIs Using Modern Software Engineering Principles: Apply contemporary software engineering principles during the implementation phase to ensure the UIs are developed efficiently, adhering to industry standards.
4. Conduct Usability Testing: Execute usability testing to evaluate the effectiveness of the UIs. Analyse the results and make necessary adjustments to enhance usability, efficiency, and user satisfaction.
5. Write a Comprehensive Report: Document the entire design process, including research, design decisions, implementation details, and the evaluation outcomes. The report will specifically highlight the application of HCI principles throughout the project.
6. Learn how to use react for database website

By systematically addressing these objectives, the project aims to not only deliver functional and user-friendly UIs but also contribute to a deeper understanding of HCI principles and their practical implications in interactive system design.

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# 3.1 Technologies I have used and why:

**Java Swing:**

Swing is part of the Java Foundation Classes and is included in the Java Development Kit (JDK) since version 1.2. It is a GUI widget toolkit that provides a collection of standard graphical components for creating user interfaces (UIs).

Key features of Swing:

* Platform independence: Swing components are written entirely in Java and do not rely on any platform-specific code. This means that Swing applications can be run on any computer that has a Java Runtime Environment (JRE).
* Extensive set of components: Swing provides a rich set of standard graphical components, including buttons, labels, text fields, menus, and dialog boxes.
* I am making the notes application in swing because it will mainly be used on desktop computer and swing is tailored for making desktop applications.

Reason I used Swing for creating the GUI as opposed to JavaFX:

* It is significantly easier and quicker to learn and use.
* With respect to the future of java, sit is more stable whereas JavaFX may be replaced with new technology in the future.
* Already included in the java JDK so it should be easy to run on my supervisors and markers computers without having to install additional software.
* Swing provides built-in support for accessibility features, making it easier for developers to create applications that are accessible to users with disabilities.

**HTML/CSS/JS with Bootstrap:**

Bootstrap is a free and open-source front-end framework developed and is a powerful and popular toolkit for building responsive and mobile-first web applications. Bootstrap simplifies the process of designing and styling web pages by providing a set of pre-built components, CSS styles, and JavaScript plugins that can be easily integrated into web projects. Only for shopping website

Why I used bootstrap and key features:

* Bootstrap provides a pre-built collection of CSS classes and JavaScript components that can significantly expedite the development process which facilitates rapid prototyping.
* **Responsive Design:** Bootstrap is built with responsive design principles, ensuring that your website seamlessly adapts to different screen sizes and devices, including desktops, tablets, and smartphones. This is crucial for providing an optimal user experience across various platforms.
* **Grid System:** Bootstrap's grid system provides a structured layout framework for organizing your website's content. This makes it much easier to create consistent and visually appealing layouts without having to manually adjust margins and padding for each element.
  + Grids help to create a consistent visual experience for users.
  + Grids can also be easily adapted to different screen sizes and devices.
  + Accessibility: Grids can also help to make designs more accessible to users with disabilities. For example, users with low vision may find it easier to scan and understand a grid-based layout. Additionally, grids can be used to create designs that are compatible with screen readers and other assistive technologies.
* **Cross-Browser Compatibility:** Bootstrap is extensively tested across various browsers to ensure consistent rendering and behaviour across different platforms.
* **Consistency:** Bootstrap's consistent design language ensures that your website maintains a cohesive look and feel throughout its pages. This enhances the overall user experience and makes the website more visually pleasing.
* **Accessibility:** Bootstrap incorporates accessibility features that make your website more usable for individuals with disabilities.

These are the reasons why I only used a framework (React) for my database interface website only and not the shopping website UI where I don't need much functionality:

* Simplicity: I only need a simple shopping website with no complex functionality, so using a framework can add unnecessary complexity. Frameworks often come with a lot of code and features that I wouldn’t need and could make my code more difficult to manage and debug. Additionally, frameworks can add additional processing overhead, which can slow down the website.
* Control: I need complete control over the look and feel of the website and using a framework can be restrictive. Frameworks often have their own built-in styles and layouts, which can limit the ability to create a unique and personalized design. Additionally, frameworks can make it more difficult to customize the behaviour of the website.
* Flexibility: This shopping website will be tested by users many times and I am focusing on having good visuals inn that one so it will be changed many times in the prototyping process as I am using a prototyping approach therefore using a framework can make this a lot more difficult and time consuming.

**React for database interface**

**Creating a database interface website for business owners and managers with Human-Computer Interaction (HCI) principles in mind is essential for ensuring the platform is user-friendly, efficient, and effective. React, a popular JavaScript library for building user interfaces, is particularly well-suited for this task due to several key features:**

1. **Component-Based Architecture: React's component-based architecture allows developers to build encapsulated components that manage their state, then compose them to make complex UIs. This modularity facilitates better design coherence, easier maintenance, and a more intuitive interface, which are crucial for HCI principles.**
2. **Declarative UI: React's declarative nature makes it simpler to create interactive UIs. Developers describe what they want to achieve (the UI state), and React efficiently updates and renders the right components when data changes. This approach makes your code more predictable and easier to debug—a key advantage when designing interfaces that are supposed to be intuitive and user-friendly.**
3. **Rich Ecosystem and Tools: React is supported by a rich ecosystem, including numerous libraries and tools that can help enhance the user experience (UX) and user interface (UI) design. Tools like React Router for navigation, Redux or Context API for state management, and Material-UI or Ant Design for UI components can greatly speed up development and ensure a more cohesive user experience.**
4. **Strong Community and Support: React is maintained by Facebook and has a massive community of developers. This means a wealth of resources, including tutorials, forums, and third-party tools, are available to help solve common design and development challenges. This community support can be invaluable when creating a user-centric interface.**

# 3.2 Motivation:

Why I’m interested:

This project presents a unique opportunity for me to engage in the creation of three distinct UIs tailored for diverse user groups and tasks. The prospect of delving into various UI technologies is very good for me as it will broaden my skill set and empower me to craft UIs that seamlessly blend usability with aesthetic appeal.

Furthermore, the project's emphasis on usability testing is of great significance to me. The ability to conduct such tests and derive meaningful insights from user feedback is a valuable skill that I am eager to cultivate. This hands-on experience will not only enhance the practicality of my UIs but also deepen my understanding of the user experience.

Moreover, the HCI project offers a comprehensive exploration of a wide array of HCI principles, ranging from cognitive psychology to design principles and evaluation methods. The prospect of acquiring knowledge in these diverse areas and subsequently applying them to create interactive systems that are both user-friendly and effective is a compelling aspect of this project. Overall, I am enthusiastic about the multifaceted learning opportunities this HCI project affords, allowing me to blend creativity with a solid understanding of human-computer interaction.

How this will help me in my future career:

Engaging in this HCI project will significantly contribute to my future career development in several keyways. Firstly, it will provide me with a thorough understanding of HCI principles and their practical application in designing interactive systems. This knowledge is invaluable, as it forms the foundation for creating user interfaces that are not only functional but also highly user-friendly and effective across various applications.

Secondly, the project will equip me with practical skills in UI design, implementation, and evaluation—skills that are increasingly sought after in today's job market. As companies prioritize user-centric approaches, the ability to create interfaces that resonate with users becomes a crucial asset. The hands-on experience gained through this project will make me well-positioned to meet this demand.

Moreover, completing this project will nurture a range of transferable skills that are vital in any professional setting. The problem-solving skills developed through HCI, which is inherently a problem-solving discipline, will enhance my ability to identify and address challenges effectively. Critical thinking skills will be honed as I engage with evidence-based practices in HCI, enabling me to evaluate research findings and make informed decisions. The creative aspects of HCI will nurture my ability to generate innovative solutions to design problems, fostering creativity as a key professional attribute. Lastly, the project will further enhance my research skills, providing a solid foundation for evidence-based decision-making in my future career.

In essence, this HCI project serves as a comprehensive learning experience that not only equips me with the technical skills demanded in the field but also cultivates a set of transferable skills crucial for success in a dynamic and evolving professional landscape.

What makes this topic significant for UI designers:

The significance of Human-Computer Interaction (HCI) for UI designers lies in its direct and profound impact on our daily lives. As we engage with computers and various digital devices on a regular basis, the quality of these interactions is crucial. HCI principles serve as a guiding force for UI designers, aiming to make these interactions as efficient, effective, and enjoyable as possible.

HCI principles play a pivotal role in creating user interfaces that align with user expectations, emphasizing ease of learning and use. In a world where digital interactions have become integral to our routines; users seek interfaces that allow them to complete tasks swiftly and effortlessly. Designers, armed with HCI principles, can craft interfaces that not only meet these expectations but also enhance the overall user experience.

Furthermore, HCI principles address the desire for intuitive interfaces. Users prefer interactions that do not necessitate reading manuals or mastering complex procedures. UI designers, by incorporating HCI principles, can create interfaces that are not only user-friendly but also intuitive and easy to comprehend. This is particularly significant as it aligns with the user-centric approach, ensuring that digital tools are accessible and usable for a diverse range of users.

The significance of HCI for UI designers lies in its ability to bridge the gap between technology and users' expectations. By adhering to HCI principles, designers can create interfaces that not only meet functional requirements but also contribute to a positive and seamless user experience, ultimately making technology more accessible and user-friendly for individuals from various backgrounds and proficiency levels.

Uses of HCI and applications/systems where it is vital:

Human-Computer Interaction (HCI) holds significant importance in various domains, particularly in enhancing the usability and effectiveness of different applications and systems. In the realm of medical devices, HCI plays a crucial role in ensuring the safety and user-friendliness of these devices, catering to the needs of both patients and healthcare professionals. In educational software, HCI is instrumental in creating engaging and effective interfaces for students, optimizing the learning experience. For websites and mobile apps, HCI principles contribute to seamless navigation and user-friendly interfaces, ensuring that users can effortlessly interact with digital platforms. Moreover, in the realm of consumer products like smartphones and televisions, HCI is vital for ensuring ease of use and creating enjoyable user experiences. By applying HCI principles across these diverse applications and systems, designers can tailor interfaces to meet specific user needs, ultimately enhancing the overall usability and satisfaction of users in various contexts.

Why HTML bootstrap REACT and java are very important

# 3.3 HCI Goals for my Ui’s:

These are some of the HCI principles I am implementing in my uis. The ones I have outlined here are the ones that are different between the 3 uis.

Shopping website:

1. **Clarity/Usability:** The primary goal is to ensure that the shopping website is user-friendly and easy to navigate. Users should quickly find the desired products with minimal effort.
2. **Consistency:**
   * Maintain consistency in design patterns and terminology. This will make it easier for users to learn and use the website.
   * Mental models of users must be respected, aligning the design with user expectations.
   * Recognition rather than recall should be emphasized, utilizing familiar design patterns and terminology for a seamless user experience.
3. **Feedback and Response Time:**
   * Provide clear feedback for user actions, whether successful submissions or errors. Then guide the user on what to do next.
   * Response times should be reasonable so that users don’t get frustrated during interactions.
4. **Error Prevention and Forgiveness:** Implement features that help prevent user errors and allowing users to recover easily from mistakes or explore different options without significant consequences.
5. **Visibility and Affordance:**
   * Ensure interactive elements are clearly visible with visual cues indicating their functionality.
   * Visual hierarchy is essential, using large fonts or contrasting colours to highlight important information.
6. **Accessibility:**
   * Integrate accessibility features like keyboard navigation, screen reader compatibility, and alternatives for multimedia content to make it easier for people with disabilities to navigate and use.
   * Ensure the website is usable by individuals with visual impairments.
7. **Learnability:**
   * Design the website for quick user understanding, minimizing the learning curve for all users, especially for those with visual impairments.

I have also created this with respect to WCAG 2.1. This was developed by the Web Accessibility Initiative and extends the principles of web accessibility established by WCAG 2.0. These are guidelines that aim to make online content more accessible to individuals with disabilities. Focusing on principles of perceivability, operability, understandability, and robustness, WCAG 2.1 outlines specific success criteria to ensure websites are usable by people with diverse abilities. By emphasizing features such as text alternatives for non-text content and accessible multimedia, WCAG 2.1 plays a pivotal role in fostering a digital landscape that prioritizes inclusivity and equal access for all users.

Notepad application:

1. **Focus:** The notepad application is designed to create a distraction-free environment for writing. Users can focus on their writing without interruptions from any other functionalities e.g., notifications.
2. **Usability:** The application should prioritize ease of use, allowing users to quickly locate and utilize its features. Also be intuitive, ensuring a seamless and efficient experience.
3. **Flexibility:** Recognizing diverse user needs, the notepad application should have the ability to customize the application to suit user preferences, enhancing the overall experience. E.g. different methods of interacting with the system
4. **Power/Efficiency:** The notepad application should be equipped with a range of features to boost user productivity, especially for expert users who require advanced functionalities.
5. **Enjoyment:** It should be enjoyable to use seeing as it is targeted towards students. User satisfaction is a key to keep students engaged as they are more likely to have lower attention spans.
6. **Internationalization:** For a global user base, the notepad application should adopt a neutral language and design. Cultural references are avoided to ensure universal understanding among users from different backgrounds.

Database management system interface:

1. **Learnability/Memorability:** Ensure that the database management system interface is easily learnable. Users should quickly grasp how to navigate and utilize the interface efficiently as they are business owners and need to be able to operate the system easily.
   * Design the interface to be memorable, allowing users to recall its usage even after a period of non-use.
2. **Efficiency and Productivity:** Prioritize the completion of tasks with efficiency and ease. Streamline workflows to empower business owners in managing their inventory effectively, minimizing the steps/complexity needed for commonly done tasks.
3. **Satisfaction:** Aim for a positive user experience, instilling confidence in users for using the system
4. **Customization:** Allow users to customize and personalize the interface according to their preferences. This is so users can easily deal with their most important tasks.
5. **Feedback/Status Updates:** Implement a feedback mechanism to keep users informed of the status of their actions.
6. **Security and Privacy:** Facilitate the security of sensitive inventory data by implementing robust authentication measures to safeguard against unauthorized access and protect the confidentiality of information.
7. **Scalability/Robustness:** Ensure that the system can handle inventories of varying scales, accommodating businesses with different sizes and levels of complexity. (This is not very applicable because my interface will not have backend functionality, but I will make it with this in mind)

4. HCI Theory

# 4.1 Background Theory:

Human-Computer Interaction (HCI) is a multidisciplinary field that explores the design, development, and use of computer systems from the perspective of the user. Some of the most important aspects of HCI are:

* Cognitive psychology: This focuses on how humans think, learn, and remember information. It is important for understanding how users interact with computers and how to design UIs that are easy to learn and use.
* Design principles: These are general principles that can be used to design effective user interfaces.
* Evaluation methods: These are methods that can be used to evaluate the usability of UIs. Some of the most common evaluation methods include user testing and reviews.

This field draws upon principles from computer science, cognitive psychology, design, ergonomics, and sociology to enhance the usability, accessibility, and experience of computer systems.

HCI theory is important because it helps to ensure that interactive systems are designed to be usable, efficient, and enjoyable to use. This is important for several reasons, including:

* Increased productivity: Usable systems can help users to get their work done more quickly and easily.
* Reduced errors: Usable systems can help to reduce the number of errors that users make.
* Increased satisfaction: Usable systems can help to increase user satisfaction with the system.

HCI theory encompasses a range of principles and models aimed at understanding the interaction between humans and technology. The goal is to create user interfaces and experiences that are not only efficient and functional but also intuitive, enjoyable, and accessible.

User-Centred Design (UCD):At the core of HCI theory is the principle of User-Centred Design. This approach places the user's needs, preferences, and abilities at the forefront of the design process. By involving users in the design and evaluation phases, developers can create interfaces that align with users' mental models and expectations.

Usability: Usability is a fundamental concept in HCI theory, focusing on the effectiveness, efficiency, and satisfaction with which users can accomplish tasks within a system. Usability principles guide the design of interfaces to minimize errors, streamline workflows, and enhance overall user experience.

Affordances: Affordances refer to properties of an object that suggest how it can be used. Signifiers are cues or indicators that communicate these affordances. In HCI, understanding and appropriately implementing affordances and signifiers help users intuitively grasp how to interact with a system.

Feedback and Guidance: Providing timely feedback to users about the outcome of their action, contributes to a sense of control and predictability, enhancing the user's experience.

**Models in HCI:**

Donald Norman’s Model of Interaction

Donald Norman's model of interaction, detailed in his seminal book "The Design of Everyday Things" (Norman, 1988), outlines the basic stages of interaction between a person and a computer: forming the goal, forming the intention, specifying the action, executing the action, perceiving the system state, interpreting the state, and comparing the outcome with the goal. This model has informed countless HCI designs by highlighting the importance of understanding user intentions and how they translate into actions within a system.

Alan Dix talks about “the golden rule of design”: which is understanding your materials.

* understand computers – limitations, capacities, tools, platforms.
* understand people – psychological, social aspects, human error.

1. The Human:

Understanding Human Cognition: Cognitive models in HCI aim to represent how users process information when interacting with computer systems. These models help designers predict user behaviour, identify potential usability issues, and devise interfaces that align with human cognitive capabilities.

Influential Models: Card, Moran, and Newell’s (1983) Model Human Processor is a seminal work that provides a framework for understanding the cognitive aspects of user interactions. It breaks down human processing into three subsystems: perceptual, cognitive, and motor, each with its own cycle time. This model aids in predicting how design changes might impact user performance.

This model conceptualizes the human mind as an information processing system, providing insights into how humans perceive, process, and respond to information. It helps designers understand cognitive factors influencing user interaction.

How do users think? Users appreciate quality and credibility. They don’t read, they scan:



These images depict heat maps revealing the focal points of user attention during online browsing. The most viewed areas, represented as the "hottest" zones, tend to cluster around the middle of sentences, which aligns with the typical scanning behaviour of web users. A user’s impatience and the pursuit of instant gratification drive users to satisfice, opting for the first reasonable choice instead of the optimal one. Optimization is a lot harder and takes a lot more time, so satisficing is generally the more efficient approach. Users rely on their intuition and seek control in their interactions.

A fundamental principle in creating a user-friendly interface is to minimize cognitive effort, following Krug's first law of usability. Webpages should be clear, self-explanatory, and have clear structure, with moderate visual cues and easily recognizable links. By reducing cognitive load, you make it easier for visitors to grasp the idea behind the system. Recognizing users' limited patience, designers should strive to keep user requirements minimal, the less action is required from users to test a service, the more likely a random visitor is to try it out.

Effective management of users' attention is crucial. Web-users can instantly recognize edges, patterns and motions, a webpage should guide attention to specific areas through use of visual elements. This approach can help your visitors to get from point A to point B without thinking of how it is supposed to be done. Guidelines are extremely effective as they lead the visitors through the site content in a very simple and user-friendly way. The less confusion and questions a user have about the page, the better the sense of orientation and provides an overall improved user experience. (11)

Mental Models in HCI:

* Mental models are based on users' beliefs about the system they are interacting with.
* They are crucial for predicting user actions and interactions with the system.
* A key challenge in HCI is aligning the designer’s mental model with that of the users.

The computer:

In Human-Computer Interaction (HCI), the model of the computer refers to the mental framework users construct about how a computer system operates. This conceptual model is a crucial aspect of designing interfaces that are intuitive and user-friendly. Users form mental models based on their interactions with other computers and systems. This system should align with the users’ expectations, and this is achieved through clear affordances, providing visible feedback, maintaining consistency in design, and ensuring effective error handling. The mapping between controls and system functions, along with the visibility of system status and options, contributes to a coherent mental model. Furthermore, a system's learnability and adaptability over time influence the users evolving conceptual model of computer systems.

* Input and output modalities: Computers receive inputs through various means, such as keyboards, touch screens, and voice commands. Outputs can be presented visually, audibly, or through haptic feedback. Interfaces should match input and output modalities to user preferences and task requirements.
* Input and output modalities: Computers receive inputs through various means, such as keyboards, touch screens, and voice commands. Outputs can be presented visually, audibly, or through haptic feedback. Interfaces should match input and output modalities to user preferences and task requirements.

Interaction Models in Human-Computer Interaction (HCI)

Interaction models in HCI provide frameworks for understanding and designing the ways in which users interact with computers. These models are crucial for creating user interfaces that are intuitive, efficient, and effective. Below, we delve into various interaction models that inform the development of HCI solutions, highlighting key theories and methodologies.

Input and Output Modalities

Definition and Importance: Input and output modalities refer to the ways users can provide input to a computer system and receive output from it. Traditional modalities include keyboards and mice for input, and screens for output. Emerging modalities encompass touch, gesture, voice, and even brain-computer interfaces (BCI) for input, as well as augmented reality (AR) and virtual reality (VR) for output.

Fitts’ Law

Principle and Application: Fitts’ Law is a predictive model of human movement, particularly in the context of pointing tasks. It states that the time required to rapidly move to a target area is a function of the ratio between the distance to the target and the width of the target. This law has been applied extensively in HCI to optimize the design of user interface elements for faster and more accurate interaction.

Research Insights: MacKenzie (1992) explores the applications of Fitts’ Law in HCI, providing guidelines for the placement and sizing of interactive elements to enhance usability.

Colour Theory: Colour is a very effective way of influencing a user, here are some of the ways it can be used to enhance the interaction between humans and computers.

* Use complementary colours to create contrast. They create the strongest contrast, which can be used to make important elements stand out.
* Use analogous colours to create harmony They create a sense of harmony and unity, which can be used to create a calm and relaxing atmosphere.
* Use triadic colours to create balance. Triadic colours are colours that are evenly spaced around the colour wheel. They create a sense of balance and stability, which can be used to create a professional and sophisticated look.
* Use tetradic colours to create interest. Tetradic colours are made up of two complementary colours and two analogous colours. They create a sense of interest and excitement, which can be used to grab users' attention.
* Different types of audiences are attracted to different colours.
* Fewer colours are generally more powerful and less overwhelming.

Nielsen's usability heuristics are a set of principles that can be used to design more usable user interfaces (UIs). They are based on the idea that users should be able to easily learn, use, and remember how to use a system. The heuristics are designed to help designers avoid common usability problems. (12)

1. Visibility of system status: The system should always keep users informed about what is going on, through appropriate feedback within a reasonable amount of time.
2. Match between system and the real world: The system’s language, terminology, and concepts should align with what users already know from their real-world experiences.
3. User control and freedom: Users should be able to backtrack or undo actions easily, offering them the freedom to correct mistakes.
4. Consistency and standards: Follow platform conventions and be consistent in your use of terminology and design.
5. Error prevention: Careful design that prevents a problem from occurring. Double-check user input and provide clear instructions to avoid mistakes.
6. Recognition rather than recall: Minimize the amount of information that users must remember by providing appropriate defaults or making information easily retrievable.
7. Efficiency and flexibility: Efficiency features and shortcuts should be available for power users without overwhelming beginners. Accommodate both users by providing clear navigation options and the ability to customize frequent actions.
8. Aesthetic and minimalist design: Clutter-free, aesthetically pleasing designs are more user-friendly.
9. Help users recognize, diagnose, and recover from errors: Error messages should be clear, concise, and constructive. They should tell users what the problem is, and how to fix it.
10. Help and documentation: Provide easy access to help and documentation, and make sure it is clear, concise, and up to date.

The concept of affordances, which originates from ecological psychology and was later adapted for HCI by Norman, refers to the perceived and actual properties of an object that determine how it can be used. A door handle affords pulling, while a button affords pushing. In HCI, understanding affordances helps designers create interfaces where users can intuitively guess how to interact with them.

Emotional Design is an evolving area in Human-Computer Interaction (HCI) that focuses on the emotional relationship between the users and the systems they interact with. It's grounded in the understanding that effective design appeals not only to users' cognitive skills but also to their emotions, creating a more profound and enduring user experience.

Norman, D. A. (2004) Talks about The Three Levels of Emotional Design:

Visceral Design: This level deals with the initial impact of a product, its appearance, touch, and feel. Norman emphasizes the importance of visceral reactions, stating that they are about immediate response – do I like this? Do I want it? This aspect of design is about the sensory experience of using a product.

Behavioral Design: At this level, the focus is on usability and the experience of using the product. Norman (2004) notes that good behavioral design is all about feeling in control, which includes understanding how to use the product and getting feedback. It’s where function meets form.

Reflective Design: This is the most profound level and concerns the user's conscious thought about the product, including its impact on their lives and their self-image. Norman (2004) articulates that reflective design is about the meaning of things, the personal and cultural significance of a product.

Affective Computing

Picard (1997) introduced the concept of Affective Computing, which refers to the study and development of systems and devices that can recognize, interpret, and process human emotions. It’s a key aspect of emotional design, aiming to narrow the emotional gap between human beings and computers, making the interactions more natural and intuitive, emotional interactions can enrich HCI, suggesting that designing for emotion goes beyond making a product easy or enjoyable to use. It’s about creating experiences that engage the whole person. This approach can lead to the development of products that are not only functionally efficient but also emotionally compelling.

Incorporating Emotional Design in HCI

User-Centered Design: Emotional design requires a deep understanding of the target audience, including their emotional responses and cultural contexts. This approach involves empathy and involves users in the design process to tailor the experience to their emotional needs.

Challenges and Ethical Considerations

While emotional design holds great promise, it also presents challenges, particularly in terms of privacy and manipulation. Designers must navigate these ethical considerations carefully, ensuring that their work respects user autonomy and privacy.

Citations:

Norman, D. A. (2004). Emotional Design: Why We Love (or Hate) Everyday Things. Basic Books.

Social impact

1. Communication and Social Interaction:

HCI has revolutionized the way people communicate and interact socially. Social media platforms, messaging apps, and video conferencing tools, all products of HCI advancements, have made it possible for people to maintain relationships across long distances, fostering a global connectivity that was unimaginable in the pre-digital era.

* However, this ease of connectivity also raises concerns about the quality of interpersonal communication, potential for misinformation spread, and impacts on mental health due to overuse or dependency on digital communication forms.

2. Accessibility and Inclusion:

HCI plays a crucial role in making technology accessible to people with disabilities, thereby promoting inclusivity. Designing with accessibility in mind—such as through voice recognition, screen readers, and alternative input methods—enables users with varying abilities to engage fully with digital content and services. This empowers more individuals to participate in educational, professional, and social activities, reducing barriers and fostering a more inclusive society.

Ethical and Societal Values:

HCI designs reflect and influence societal values and norms. The decisions made in the design process—what to include or exclude, how to represent individuals and communities—can reinforce stereotypes, biases, or ethical standards. There is a growing recognition of the need for HCI research and practice to be guided by ethical considerations, emphasizing respect for user autonomy, consent, and diversity.

Interaction Models:

Interaction models in HCI provide frameworks for understanding and designing the communication process between users and computer systems. These models are crucial for creating interfaces that are intuitive, efficient, and satisfying for the user. Below, we discuss several key interaction models and their implications for HCI design, incorporating both foundational theories and contemporary approaches.

* Direct manipulation, introduced by Shneiderman in the 1980s, is a model where users interact with visible objects on the screen in a manner that feels like physically manipulating the objects (Shneiderman, 1983). This model emphasizes immediate, reversible actions with continuous feedback, allowing users to feel in control of the computer application.
* Donald Norman’s model of action, detailed in "The Design of Everyday Things," outlines the gulfs of execution and evaluation, which represent the gap between a user's goals and the means to achieve them (Norman, 1988). The gulf of execution refers to how well the system allows users to enact their intentions, while the gulf of evaluation reflects the system's ability to provide feedback that matches the user's expectations.
  + Expanding on the concept of gulfs, Norman also proposed the Stages of Action model, which breaks down the interaction into seven stages: forming the goal, forming the intention, specifying an action, executing the action, perceiving the system state, interpreting the state, and evaluating the outcome. This model helps designers consider each step a user must take to accomplish their goals and how each step can be supported by the interface.

Interaction Techniques in Human-Computer Interaction (HCI)

Advanced interaction techniques in HCI explore innovative ways for users to engage with digital systems beyond traditional input devices like keyboards and mice. These techniques aim to make interactions more intuitive, efficient, and aligned with human behaviours and expectations.

- Gestural Interfaces: interact with digital systems through body movements and gestures. This includes touch gestures on screens (e.g., pinching, swiping) and air gestures (e.g., hand movements in free space) recognized by sensors or cameras.

Significance: Gesture-based interactions offer a more natural and intuitive way for users to control devices, particularly in environments where traditional inputs are impractical.

- Voice User Interfaces (VUIs): Voice user interfaces enable interaction with systems through spoken commands, making technology accessible without the need for physical inputs. VUIs are central to digital assistants like Siri, Alexa, and Google Assistant. Impact: VUIs can significantly improve accessibility for users with physical disabilities and provide convenience in contexts where hands-free operation is preferred.

- Augmented Reality (AR) and Virtual Reality (VR): AR overlays digital information onto the real world, while VR creates fully immersive virtual environments. Both technologies offer rich, interactive experiences that go beyond the constraints of traditional screens. Applications: AR and VR have applications in education, training, entertainment, and healthcare, offering immersive ways to learn, collaborate, and explore.

**Virtual Reality (VR) and Augmented Reality (AR)**

VR and AR are technologies that create immersive digital environments for users, altering the way people interact with digital content. VR immerses users in a completely virtual environment that is disconnected from the real world, while AR overlays digital content onto the user’s view of the real world, enhancing it with interactive digital elements.

**VR Characteristics**

* **Immersive Experience**: Engages users in a fully digital environment, often using head-mounted displays (HMDs).
* **Applications**: Used in gaming, training simulations, and education, providing experiences that are either impractical or impossible in the real world.

**AR Characteristics**

* **Enhanced Reality**: Superimposes digital information onto the real world, visible through devices like smartphones or AR glasses.
* **Applications**: Includes navigation aids, educational tools, and interactive marketing, blending digital content with the physical world.

- Other: Brain-Computer Interfaces (BCIs), Multi-Touch Interfaces, Tangible User Interfaces (TUIs)

References: Wobbrock, J. O., Morris, M. R., & Wilson, A. D. (2009). "User-defined gestures for surface computing."

Ubiquitous Computing and IoT: a concept where computing is made to appear anytime and everywhere. In ubiquitous computing, computers become an integral part of the environment, woven into the fabric of everyday life until they are indistinguishable from it. The Internet of Things (IoT) is a pivotal aspect of ubiquitous computing, where everyday objects are connected to the internet, allowing them to send and receive data. This interconnectedness enables a seamless integration of digital and physical worlds, creating smart environments.

* **Characteristics and Impact**
* **Pervasiveness**: Computing devices are embedded in everyday objects, from wearables to household appliances, making technology pervasive.
* **Context-Awareness**: Systems are aware of their context, adapting their operations to the current environment or user needs, enhancing user experience.
* **Interconnectivity**: IoT devices communicate with each other and with cloud-based services, automating tasks and providing real-time feedback.
* **Applications**
* **Smart Homes**: Thermostats adjust temperature based on user habits, and lights turn off automatically when rooms are unoccupied.
* **Healthcare Monitoring**: Wearable devices monitor vital signs, sending alerts to healthcare providers if anomalies are detected.

**Methodologies in HCI**

The methodologies in HCI are diverse, ranging from empirical research methods to design and evaluation techniques. These methodologies are essential for understanding user needs, designing interfaces that meet those needs, and evaluating the usability and effectiveness of those interfaces.

**Empirical Research Methods**

* **Surveys and Interviews**: Collect qualitative and quantitative data on user preferences, experiences, and needs.
* **Usability Testing**: Involves observing users as they interact with a system to identify usability issues.

**Design Methodologies**

* **Prototyping**: Creating mock-ups or working models of interfaces to explore design concepts and gather user feedback.
* **User-Centered Design (UCD)**: Focuses on involving users throughout the design process to ensure the product meets their needs and preferences.

**Evaluation Techniques**

* **Heuristic Evaluation**: Experts use established heuristics to evaluate the usability of an interface.
* **A/B Testing**: Comparing two versions of a web page or app to see which one performs better on specific metrics.

**Ethnographic Studies**

* **Field Observations**: Researchers observe users in their natural environment to understand how they interact with technology in their daily lives.

References: MacKenzie

# 4.2 Literature review:

Here I am only writing about the main resources I used, there were many mor resources such as papers and web articles.

**Human-Computer Interaction (3rd Edition), Alan Dix, Gregory D Abowd, Janet E Finlay and Russell Beale (1)**:

Introduces the core concepts and scope of HCI, defines HCI and its importance in the modern world. It is a foundational text that offers comprehensive insights into HCI principles, design considerations, and user experience. The book's focus on user-centred design, iterative development, and robust evaluation techniques makes it invaluable in the HCI field. Specific chapters and pages, such as Chapter 5 (Pages 3, 4, 8, 10, 14), Chapter 6 (Pages 38, 48), Chapter 8, and Chapter 10, provide detailed insights into these topics, contributing significantly to the understanding and advancement of human-computer interaction. I will be discussing the most important chapters that pertain to my UI’s here and their significance in my UI’s.

In the first three chapters, the authors provide an overview of the human and computer aspects of HCI, as well as the interaction between humans and computers. Here is where Dix talks about Cognitive Models (also further discussed in chapter 12) and models of interaction: Alan Dix discusses the use of cognitive models to understand how users process information and interact with computer systems. He also talks about Models like the Human and The Computer and how you need to understand these to be able to create a good and usable UI. These models can inform the design of interfaces that are more aligned with human cognitive processes, making them easier to use.

User-Centered Design (UCD): The book strongly advocates for UCD as a framework for HCI development. UCD involves users throughout the design process through techniques such as user research, persona creation, and usability testing. This approach ensures that the final product is tailored to the users' needs, preferences, and limitations.

Iterative Design: Another key methodology discussed is the iterative design process. This involves repeatedly designing, prototyping, and testing interfaces, then using the feedback to refine the design. This cycle helps in identifying usability issues early and ensures that the final interface is as intuitive and user-friendly as possible.

Chapter 7 is one of the main chapters that helped me design my UI’s as it talks about design rules and designing for maximum usability. This is where the book starts to delve into abstract principles of design to help the reader understand usability itself. It also discusses how these design rules and principles help form standards and guidelines to provide direction when designing a UI. Chapter 16 also helped with this as it talks about the design of dialog and Notations used for dialog description can be:–diagrammatic: easy to read at a glance– textual: easier for formal analysis. This chapter helped my learn how instructions can be effectively portrayed to the user as well as many different interaction styles such as menus and forms.

Some other topics this book delves into are evaluation techniques to test the usablility and functionality of a systsem and approaches towards this (Chapter 9). Chapter 10: Unsiversal design is about “designing systems so that they can be used by anyone in any circumstance” and also discusses multi-modal systems which have various methods of inputs, which was important for my notes application which is also a touchscreen app. This chapter was especially important to me as here it discusses how we should design for diversity such as people with sensory, physical or cognitive impairment, people of different ages and people from different cultures and backgrounds.

Overall, Human-Computer Interaction (3rd Edition) is an excellent resource for anyone interested in HCI. The book is well-written and provides a good balance between theory and practice. The authors provide many examples and case studies to illustrate the concepts covered in the book, making it easy to understand and apply the material. Its comprehensive overview and emphasis on core principles make it a valuable resource for students, practitioners, and researchers and Its focus on user-centered principles ensures its continued relevance as a key reference in the field.

**Designing the User Interface: Strategies for Effective Human-Computer Interaction (6th Edition) by Ben Shneiderman (5):**

"Designing the User Interface: Strategies for Effective Human-Computer Interaction" (6th Edition) by Ben Shneiderman is an essential text in the field of human-computer interaction (HCI), providing an in-depth exploration of design principles and strategies crucial for creating effective user interfaces. This comprehensive overview encapsulates the methodologies for designing interfaces that are efficient, learnable, and satisfying for users, underscored by practical examples and case studies that illustrate these concepts in action.

Chapter 1, titled "The Eight Golden Rules of Interface Design," delineates Shneiderman's foundational guidelines for crafting user-centric interfaces. These rules, which include striving for consistency, enabling shortcuts, offering informative feedback, and minimizing users' memory load, are instrumental in enhancing the user experience by making interfaces more predictable, forgiving, and easy to navigate.

In Chapter 2, "Direct Manipulation," the book delves into a design strategy where users interact with on-screen objects in a way that mimics the manipulation of physical objects. This approach aims to make systems more intuitive and engaging by providing immediate feedback to actions, thereby enhancing the user's sense of control and ease of use.

Chapter 3, "User-Centered Design (UCD)," emphasizes Shneiderman's advocacy for a design philosophy that prioritizes the needs, wants, and limitations of end-users throughout the design process. This chapter outlines methods such as user research, persona creation, and usability testing, ensuring that the final product resonates with the target audience's preferences and requirements.

"Information Visualization," covered in Chapter 4, focuses on strategies for presenting complex data through visual representations like graphs and charts. This is pivotal for enabling users to comprehend and interact with information, thereby aiding in better decision-making and insight generation.

Chapter 5, "Universal Usability," addresses the significance of creating interfaces accessible to a diverse range of users, including those with disabilities. Strategies for achieving universal usability, such as adherence to accessibility standards and inclusive user testing, are discussed to ensure designs cater to a broad spectrum of user capabilities and preferences.

The book also ventures into "Social Media and Collaboration" in Chapter 6, exploring the design of interfaces that support social interaction and collaborative efforts. Shneiderman discusses the necessity of features that facilitate communication, sharing, and community building, highlighting the design considerations for trust, privacy, and security in these digital environments.

In conclusion, "Designing the User Interface" by Ben Shneiderman offers a profound framework for developing human-computer interfaces that are not only functional and efficient but also enjoyable and accessible to a wide audience. Through its emphasis on user-centered design, direct manipulation, the eight golden rules, information visualization, universal usability, and the dynamics of social media and collaboration, the book stands as a cornerstone for those seeking to design or enhance HCI interfaces, providing a robust foundation for meeting and exceeding user expectations.

**Empirical Research in HCI (Human-Computer Interaction: An Empirical Research Perspective by I. Scott MacKenzie) (6):**

"I. Scott MacKenzie's 'Human-Computer Interaction: An Empirical Research Perspective' is a pivotal text in the domain of HCI, offering a comprehensive exploration of empirical research methodologies. The book sets itself apart by focusing on the scientific principles essential for evaluating and designing computer interfaces and interaction techniques, distinguishing itself from more design-oriented HCI literature.

The initial chapters provide a foundational overview of HCI's historical context, the human factor in technology use, interaction elements, and the basics of scientific inquiry and research methodology. This grounding prepares readers for the subsequent, more detailed exploration of empirical research methods in HCI.

Chapter 1, 'Introduction to Empirical Research,' lays the groundwork by detailing the historical development of HCI and introducing the key concepts of human factors and interaction design. It sets the stage for the empirical research perspective that the book advocates.

Chapter 2, 'The Fundamentals of Science and Research in HCI,' dives into the core scientific methods applicable in HCI research. This includes hypothesis formation, the design and execution of experiments, and the ethical considerations crucial for research involving human participants. MacKenzie emphasizes the importance of research ethics, informed consent, data privacy, and minimizing harm.

In Chapter 3, 'Experimental Design and Analysis,' MacKenzie explores various experimental designs (between-subjects, within-subjects, and mixed designs), detailing how to control variables and conduct statistical analysis to ensure robust and valid research findings.

Chapter 4, 'Measuring User Performance,' focuses on quantifying interaction effectiveness through metrics such as speed, accuracy, error rates, and subjective user ratings. This chapter introduces Fitts' Law as a predictive model for HCI and discusses qualitative assessments for gathering in-depth data on user experiences.

Chapter 5, 'Conducting Empirical Research in HCI,' guides readers through designing and implementing HCI experiments. It covers hypothesis formulation, apparatus and material selection, participant recruitment, and procedure design, including counterbalancing techniques to address order effects.

Chapter 6, 'Analyzing and Presenting HCI Research,' provides a thorough overview of statistical analysis methods, data visualization techniques, and the intricacies of writing and publishing research papers in the HCI field.

MacKenzie's text is invaluable for its rigorous approach to empirical research methods in HCI, ensuring that studies in the field are founded on reproducible and sound findings. However, the book's emphasis on empirical research might limit its direct applicability for designers not primarily engaged in research.

The book also extensively covers methodologies for designing HCI interfaces, including user-centered design (UCD), experimental design, usability testing, quantitative measures, qualitative research methods, and advanced techniques like eye tracking and physiological measures. These methodologies are integral for developing interfaces that are functional, intuitive, and satisfying for users.

In conclusion, 'Human-Computer Interaction: An Empirical Research Perspective' by I. Scott MacKenzie is an essential resource for researchers, designers, and practitioners in HCI. It provides a thorough foundation in empirical research methodologies, ensuring the development of effective and user-friendly computer interfaces. The inclusion of advanced research techniques highlights the depth of investigation required to enhance human-computer interactions, making this text a cornerstone for those committed to advancing the field of HCI."

5. My Progress so far

# 5.1 Work completed:

I dedicated a significant portion of this term to conducting a thorough literature review on HCI principles, methodologies and theory. This involved learning various design techniques and theoretical foundations so I can have a solid groundwork for the subsequent design and implementation of my UI’s. Notably, reading Alan Dix's book [1] was a milestone, enriching my understanding of HCI and providing valuable techniques for designing user interfaces. I focused particularly on the chapter’s most relevant to my project, documenting these chapters in my diary and making notes on everything ii could use for my designs.

In addition to this I learned practical methodologies through Scott Klemmer's lectures, focusing on design heuristics and visual design [4]. The I read research papers on the topic, including one by Sinha, Shahi, and Shankar on Human-Computer Interaction [3], and thoroughly reviewed and noted key points from articles such as "10 Principles of Effective Web Design" and "Designing for the Web: An Introduction to Human-Computer Interaction" by Jakob Nielsen.

As I was doing this, I developed my detailed project plan which was a crucial step in organizing my tasks and ensuring a systematic approach. Three user interfaces were also designed, each tailored to cater to different user groups and tasks so I could apply different aspects of HCI. Despite the challenges of balancing extensive literature review with development efforts, I maintained my diary to record mistakes, challenges, and track my progress, ensuring I have everything I will need for my final report.

As part of my design strategy, I adopted a greyscale layout for all UIs based on insights from Scott Klemmer's lectures. This approach, avoiding the use of colour for visual distinctions between components, has facilitated a clearer differentiation of elements on each page, with varying shades of grey indicating the importance of different items. Next term I will implement colour using principles from colour theory. After each iteration of my UIs, I have tested their usability with actual people which I have recorded in my diary. For the html programs I have not linked each page together yet as they are all still in progress and the paths are changing.

**Shopping website:**

I have begun this website by first using Canva to make a design for this website including all the HCI principles I had learnt. I previously planned to have this website targeted towards students but after more research and discussion with my supervisor I changed it to be targeted towards any user with visual difficulties. This is because I can use many different HCI principles that would be different from my other UIs whereas the previous version would be too like the other UI’s. I started by creating a navigation bar using bootstrap and adding the essential features of the website on it by taking inspiration from other popular websites like amazon.co.uk. I also added components/widgets like buttons, labels, text fields, and more to the website window. I then added Empty cards where I have put placeholder items that are being sold. Currently I am designing a few different product pages and a cart which will help me demonstrate how an average user could use this website. I then created another page which will act as the homepage of the website and will direct the user to wherever they need to go.

I first had to learn how to use bootstrap. I have made this webpage using bootstraps grid system as it was the most efficient way to have all the elements and components on the page in a symmetrical and centred position. Alignment guides the eye, reducing clutter. I had some issues learning how to use bootstrap and especially how to control and manipulate the columns and rows, but this video really sped up my progress: <https://www.youtube.com/watch?v=-qfEOE4vtxE>. I have had to redesign the website a couple of times a as I kept improving and building on the previous prototype using the knowledge I have acquired during my research. I also researched how to test my UI’s using selenium.

After developing the shopping websites layout and structure I applied styling using CSS. While Bootstrap accelerated the process, including my CSS files in IntelliJ proved troublesome as they would not connect to the main html file, this prompted a switch to VS Code which seemed to instantly fix the issue. The decision to not use a framework or React for the website was a strategic one, based on the project's specific needs and my comfort with the technologies. I originally began learning and using react, but I did not continue for the reasons I mentioned previously. After all of this I did user testing with visually impaired people and used the insights I got to create a settings page with functionality for dark mode, high-contrast mode, and larger text mode. These all have functionality and apply to all the pages. I then created a screen reader button which also has functionality but only on the cover page at the moment. I also conducted UI testing using selenium.

Next, I will begin adding functionality like saving items in the basket and being able to buy items and error prevention functionality to prevent users performing actions they did not mean. This will include setting up event handlers to respond to user interactions (e.g., button clicks) for website. I will also create many more pages for this website like a help page (Learnability/Usability) and a menu bar that shows the user which stage of the buying process they are on (Visibility and affordance). I will then focus on the design of the page and make it look cleaner and more visually appealing along with transitions when a user performs an action or moves to another page to grab the user’s attention.

**Notes application:**

I began by learning Java Swing using this course: https://www.youtube.com/watch?v=Kmgo00avvEw&t=3s. I first made a design of the application using Canva, as well as all the functions and buttons that the application will need. I designed the multiple navigation bars for different functions by taking inspiration from other word processors like Microsoft word. I have created a panel with a navbar and a page where users would write. This is all still in greyscale so I can design the layout properly without using colour as a crutch. I am currently creating the multiple navigation bars, but I have had problems switching between them, so I have just left them as three separate ones for now. After this I added components like buttons, labels, text fields to the window. After all of this I Set up event handlers to respond to user interactions (e.g., button clicks) but now they do not do anything they just output to the console what action has be done.

The development of the Java GUI for the note’s application required meticulous attention to HCI principles, ensuring both functionality and user-friendliness. Even though I will not have much backend functionality, I am designing my user interface to be mainly functional as it will be used by students who are likely to have a lot of technical expertise. I have also redesigned the inventory interface a few times for better visual appeal as I was learning and get more comfortable with swing and learning more about HCI which was very time-consuming. I have redesigned this one a few times, adding functionality for typing and changing fort colour and format. After this I gave this to students to test and added the feedback to the application. I created another side menu with undo and redo buttons that are easily visible (Error recovery), and also a full screen mode to facilitate focus. I also added a Touch screen mode to be used with touch screen computers/laptops, this brings up an onscreen keyboard which can be moved around (Flexibility- different ways of interacting with the system). In this endeavour I used TDD and junit 5 for testing which caused allot of struggles for me which I explain in my diary.

I will add more functionality to the components for example adding support for keyboard shortcuts. I will also add a functional menu where users can add their own functions which are most used and also change the colours and background of the interface (Efficiency, customizability, productivity). I will then work on the design and over all appeal of the interface to make it more suitable for students.

**Inventory management interface:**

I began this user interface by also designing it in Canva. For this one I was going to have an account system and a responsive design as it will be used by professionals and must be very efficient and meet at the requirements they would have. I first created the database where all the account information and users’ inventory would be stored. After a meeting with my supervisor, I was informed that I dint need that much functionality so I am going to uses the MySQL database just to store random information which can be used by the inventory system. I then begun making the UI using html/CSS/js and bootstrap. The was quite say as I already had experience with bootstrap from the first website UI. As with all the other user interfaces I created the frame of the interface and started by created a side navigation bar. I then added columns of inventory stock next to it where I just used placeholder information.

I began this UI using colour but after my research I redesigned it to have an upper navigation and a side navigation bar and to be in grayscale. This was all to cater towards my target user which my first design didn’t do as well. I made these changes after doing user testing with university students. I will explain all the aspects of my design below. I also redesigned the interface again moving around components and making it look more modern and visually appealing. After user testing, I added many more pages such as login, signup and two factor authentication (Security). I also added a help menu to the cover page (Help, learnability). I also added a button for voice control of the system, this will make it easier for users to interact with the system (Flexibility). I then conducted UI testing using selenium and the chrome extension. I will the add all the functionality for these and add functionality to personalise the inventory by changing the picture and names of inventory items, I have already implemented the menus for this. I will also make a customizable homepage. A few more functions I will implement are a button to export to Excell and google sheets and loading bars to show the systems status.

# 5.2 My process of design:

This image describes how I have been designing my Ui’s. I began by finding my users requirements, then I analysed how I would fulfil those requirements. After I repeatedly designed and tested these uis and added all the feedback. When my UIs are at their best versions, I will deliver the final product.

A diagram of my design process

Description automatically generated

# 

# 5.3 Designs and HCI principles:

I will now discuss my UI’s and how I have tailored them to HCI standards and principles, refer to theory section for explanations of the principles that I am mentioning are.

A screenshot of a computer

Description automatically generatedInventory management system:

A screenshot of a login page

Description automatically generatedA screenshot of a computer

Description automatically generatedA screenshot of a login form

Description automatically generated

A screenshot of a computer screen

Description automatically generatedA screenshot of a computer

Description automatically generated

* This interface will have learnability integrated into a help system which will come up with tool tips and guidance on how to use the system. Will also have help and manual section.
* To promote efficiency, productivity, and flexibility, all the main functions and options are on the home screen and easily accessible. There will also be shortcuts for the most used functions.
* This should also be a memorable interface as it will always have the same layout on every page and on every device, it is used on.
* Security and privacy: Provide real-time feedback on inventory changes, updates, and system status. Timely notifications and alerts can help business owners stay informed about critical events affecting their inventory.
* There is a + - icon to increase and decrease the size of the Screen, these will have tooltips or name tags to explain what they do.
* To facilitate user control and freedom, there will be the options to undo/redo, delete, exit anything they have done.
* It has a very minimalist design reducing cognitive load.
* Will also have customizable home page as the system will be able to hold a lot of data so the user can put their most important data in the homepage.
* To show the systems tatus I will have a loading bar, so the user does not get frustrated thinking nothing is going on.

A screenshot of a computer

Description automatically generatedA computer screen with text and a window

Description automatically generated with medium confidenceNotes application:

A black text with a white background

Description automatically generated

A close-up of a computer screen

Description automatically generated

A computer keyboard with a keyboard and a keyboard

Description automatically generated with medium confidenceA screenshot of a computer

Description automatically generated

* Design is easy on the eyes and simple so students will pay attention and not get bored quickly (satisfaction).
* This will also give feedback about the storage of the system and feedback about any changes and actions made e.g., confirmation of change popup.
* The help section adds more usability to the application, The notepad application will have an integrated search feature to help users quickly locate specific notes and any functions they need.
* Error correction: One way this will be done is Spell checking: The notepad application will include spell checking to help users catch and correct mistakes.
* It is also robust as it provides many options and functions for the user.
* All components will have consistent names with other word processors to make them easy to recognize.
* It will also prevent errors, e.g., data loss from the computer closing abruptly, bad input.
* I will also have a language setting for different languages. Also has very simple and neutral language to be easily used by different user groups (internationalization).

A screenshot of a computer

Description automatically generatedA screenshot of a computer

Description automatically generatedShopping website

A screenshot of a computer

Description automatically generatedA screenshot of a checkout form

Description automatically generated

A screenshot of a computer screen

Description automatically generated

* This website provides clarity as it is simple and easy to understand, it also has a consistent styling for each page all this also helps with recognition rather than recall. Also aligns with users’ mental models of other websites.
* I will provide clear and concise feedback for every action the user does e.g. popup when something is added to the basket.
* It will also have audio feedback such as button clicks and error sounds for visually impaired people.
* It will have error prevention by making sure that the option a user is doing is what they want to do, e.g., buying something, before a user pays for their items, they will have to check the basket where they can remove items if needed.
* I will be providing accessibility by designing the website in a way where it is compatible with devices such as screen readers.
* Learnability is also included as it is very simple to use and therefore quickly learnt.
* There will also be a bar and a section of the page to show how far the user is in their buying process. User feedback
* The categories of items will be like items in other shops.
* It has a very minimalist design. (Clarity)
* The size of each element indicates its hierarchy.
* I created this using grid which can help to make designs more accessible to users with disabilities. For example, users with low vision may find it easier to scan and understand a grid-based layout. Additionally, grids are used for designs that are compatible with screen readers and other assistive technologies.

# 5.3.1 Other HCI methodologies I have included in my designs:

Consistent Names, Clear Choices, ensuring that users encounter uniform and comprehensible terminology throughout the interfaces. This not only simplifies navigation but also fosters a sense of familiarity.

The principle of Recognition over Recall has been prioritized, emphasizing the presentation of recognizable elements over expecting users to recall information. Aiming for a user-friendly experience, I incorporated Aesthetic and Minimalist Designs to eliminate unnecessary clutter and enhance visual appeal. Additionally, strategic use of whitespace has been implemented to convey grouping and improve overall readability.

Size contrast and hierarchy have been effectively employed using varying text sizes and thickness, promoting an intuitive understanding of content structure. Furthermore, I selected a font with a high X-height, as research indicates that a higher X-height facilitates easier online reading for a broader audience.

In adhering to best practices, mixed typed case has been favoured over all caps, allowing for greater vertical variation and providing the reader's eye with more information during the reading process. Initially, I utilized tools like scale and layout to distinguish elements on the page, foregoing heavy reliance on colour.

The incorporation of grids has played a crucial role in establishing a consistent visual experience for users. This design choice ensures a structured and organized layout, contributing to a seamless user interface.

Generic icons have been strategically employed to facilitate repeat recognition, leveraging users' familiarity with visual representations rather than relying solely on textual cues. Furthermore, I have prioritized the design for "glanceability," enabling users to quickly absorb and comprehend essential information.

To draw attention to critical information, such as error messages, I implemented dynamic elements such as flashing or moving features. This approach effectively captures the user's attention and communicates the urgency of the message.

Menus and toolbars/navbars have been thoughtfully designed to minimize user demands, relying on recognition rather than recall. Logical grouping and meaningful naming of menu options provide users with cues for locating the required functions. In toolbars/navbars, icons have been strategically placed to align with users' natural scanning patterns, reducing the need for extensive reading or referencing manuals.

Dialog boxes have been strategically employed for presenting important information, ensuring that users receive essential notifications or prompts. This approach allows for a focused and unambiguous communication channel, enhancing the overall user experience.

# 5.4 Software engineering:

Throughout the development of this project, I have been applying software engineering principles and methodologies to ensure that all my interfaces are not just user-friendly but also robust, reliable, and easy to understand and maintain.

**Use of Revision Control System**

I have been using a revision control system, specifically Git, to manage all the project's source code for all three user interfaces. This enables me to track changes and maintain a well-organized codebase. Git allows me to create branches for new features or fixes, merge changes, and roll back if necessary. One risk throughout the project is the potential for hardware failure, which could result in significant data loss and disruption to my project. This is not a very high risk but to address this concern, I am using GitLab, this is a version control system which hosts your repository online. This strategy involves regular code commits to ensure that all my project code and data are safely stored on git which I can access from anywhere. This means that even in the event of local hardware failure, no critical data will be lost. Additionally, this aids in managing various program versions which lets me retrieve older versions of my code in case of any issues, thus minimizing potential time and effort wastage. This ensures the integrity and traceability of my codebase.

**Test-Driven Development (TDD)**

I have been using Junit 5 tests to test my java swing classes. For testing the Swing applications actual GUI, I will be using a dedicated GUI testing library. One popular library for Swing GUI testing is AssertJ Swing.

I have adopted Test-Driven Development (TDD) as a key methodology in the software development process of my Java Swing notes taking application. TDD involves writing tests before implementing features. This approach helps me identify and address issues early in the development cycle, leading to a more robust and reliable software product. Another reason I am using TDD is that the test cases serve as executable documentation, and they provide examples of how your code is expected to behave which make it easier for others to understand my code.

A computer screen shot of a program code

Description automatically generated

**Agile Methodology**

I have used anagile methodology to develop these UIs as they are well-suited for projects with changing or evolving requirements. It also promotes, frequent feedback, and iterative development. This is all needed as this project involves heavily prototyping code and improving the user interface with HCI knowledge.

**User-Centred Design (UCD)**

UCD focuses on understanding the needs and preferences of users. It involves techniques like personas, user stories, and usability testing to create interfaces that align closely with user expectations. This is extremely relevant to my project as HCI is all about how a user interacts with the system and my UIs are designed around how a user would use them.

**Code Quality Tools**

I am using tools like prettier for vs code to keep my code style consistent. Another reason that this is very useful is that manually formatting code can be time-consuming. Prettier automates this process, saving me a lot of time and allowing me to focus on writing and understanding the logic of the code rather than its presentation. It also allows me to easily stick to my code standard for all my separate user interfaces. I have also used svgs for icons so nothing else has to be installed such as special FontAwsome icons.

5.Proffesional issues

Professional issues: approx.. 1000 words

Professionalism in computing is concerned with the societal impact of computer technology and the creation and understanding of policies for the ethical use of such technologies.

Professional bodies such as the [**British Computer Society**](http://www.bcs.org/category/6030) (BCS) and the [**Association for Computing Machinery**](http://www.acm.org/about/code-of-ethics) (ACM) help ensure professionalism and ethical behaviour by providing standards and a code of individual conduct: guaranteeing certain levels of competence, integrity and a commitment to the interests of all end-users and other stakeholders.

some professional issues: correct citation, licensing, accessibility etc.

Usability - accessibility, replacing humans, artificial intelligence.

* describe an example from the public domain of what can happen when professional issues are not properly addressed; or
* write about how a particular issue has been of concern to you in your project; or
* describe some professional issue that has arisen during your project and discuss its ethical or practical importance.

6.Timeline with changes

**Term 1**

Week 1-2 starting 18/09/23:

* Start research, [**Human-Computer Interaction (3rd Edition)**](http://www.amazon.com/gp/product/0130461091?ie=UTF8&tag=hci01-20&linkCode=as2&camp=1789&creative=9325&creativeASIN=0130461091)**, Alan Dix, Gregory D Abowd, Janet E Finlay and Russell Beale**
  + **Read chapter 1, The Human, 2.3 Positioning, pointing and drawing, 2.4 Display devices, 2.10 Summary.**
* Work on the project plan, draft should be finished by the 27th of September and sent to supervisor.
* -Meeting with my project supervisor on Wednesday the 25th of September
* -Set up Eclipse and GitLab

Week 3:

* Read Paper: **Sinha, Gaurav, Rahul Shahi, and Mani Shankar. Human computer interaction**
* Finish Timeline, Bibliography and risk assessment by the 4th of October, then I will submit on the 5th.
* Plan and design all 3 UIs using Canva [10], using [7] as a design guide.
* Start creating a database with no information stored first plan database schema.
* Alan dix. Chapter 3, 4.3 Summary

Week 4:

* Continue Database with MySQL, Begin website interface for DBMS.
* Continue [**Human-Computer Interaction (3rd Edition)**](http://www.amazon.com/gp/product/0130461091?ie=UTF8&tag=hci01-20&linkCode=as2&camp=1789&creative=9325&creativeASIN=0130461091)**, Part 2: Design processes**
* Finish basic website layout.
* 5.4 User focus, 5.6 Navigation design, 5.7 Screen design and layout, 5.8 Iteration and prototyping.
* 6.3 Usability engineering, 6.5 Design rationale, 7.2 Principles to support usability, 7.5 Golden rules and heuristics, 7.6 HCI patterns, 7.7 Summary.

Week 5:

* Add components/widgets like buttons, labels, text fields, and more to the website window.
* Set up event handlers to respond to user interactions (e.g., button clicks) for website.
* Begin learning Swing [9] for Java desktop application.
* 8.5 User interface management systems, 8.6 Summary, 9.6 Summary, 10.2 Universal design principles, 10.3 Multi-modal interaction, 10.4 Designing for diversity.
* Finish SQL database, Use spring boot for the backend of the DBMS interface.
* Read: Designing for the Web: An Introduction to Human-Computer Interaction by Jakob Nielsen

Week 6:

* Begin desktop interface with swing.
* 10.5 Summary, 11.2 Requirements of user support, 11.3 Approaches to user support, 11.5 Designing user support systems.
* Watched and made notes on Scott Klemmers lectures. Design Heuristics parts 1 and 2, Visual Design
* Watched and made notes on Scott Klemmers lectures. Typography, Grids and Alignment, Reading and Navigation, Designing Studies
* Continue working on backend of website to add functionality.
* Start writing interim report.
* Continue DBMS interface, Website using html/CSS/js.
* Continue [**Human-Computer Interaction (3rd Edition)**](http://www.amazon.com/gp/product/0130461091?ie=UTF8&tag=hci01-20&linkCode=as2&camp=1789&creative=9325&creativeASIN=0130461091)**, Part 3: Models and theories**. This talks about a user’s cognitive and problem-solving abilities: 12.7 Summary, 13.4 Summary, 14.6 Summary, 16.2 Dialog design notations, 16.3 Diagrammatic notations, 16.6 Dialog analysis and design, 16.7 Summary.
* Interim Report: aims, objectives and literature survey.

week 7 – week 8:

* Continue application and database interfaces.
* 17.5 Summary, 18.5 Summary, 19.8 Summary, 20.4 Information and data visualization, 20.5 Summary, 21.2 Understanding hypertext, 21.7 Summary.
* Start presentation: explain the aims and objectives clearly, explain the background/relevance/importance of the project and set it in the wider context, I’ve made a broad description of the project - i.e. how parts of the project fit together to form a coherent whole.
* Continue [**Human-Computer Interaction (3rd Edition)**](http://www.amazon.com/gp/product/0130461091?ie=UTF8&tag=hci01-20&linkCode=as2&camp=1789&creative=9325&creativeASIN=0130461091)**, Part 4:Outside the box**
* Finish Report Draft
* Interim Report: summary of completed work.
* bibliography and citations.
* Background Theory
* Software Engineering

Week 9 – Week 10:

* Week 9 submit report draft.
* Conduct user testing on the three implemented interfaces. (Beginning of Week 9)
* Continue presentation and report.
* Presentation: briefly explain the theory underpinning the individual parts of the project (for example how algorithms work, or which architectural options existed including their benefits/ drawbacks), defend and justify decisions made during the project.
* Interim report due 1st December
* Presentation to be submitted 2nd December.

Week 11:

* Presentation on 4th December

**Term 2**

Week 1 (Starting 15/1/2024):

* Start on feedback from testing and implement for all UIs
* Evaluate and improve shopping website design, Add screen reader functionality to all other pages
* Begin on affordance features in for shopping website
  + Make only visual effects for progress bar of shopping
  + And visual effects for help menu guiding you through the interface
* Add functionality for error recovery buttons and options in notes application
  + Add functionality for print sub menus
* Put dashboard page of inventory interface into a function for react

Week 2 – Week 3:

* Have meeting with supervisor
* Create table of contents for final report and give to supervisor for checking
* Start work on final report, first add more in-depth information to HCI theory section
* Make all pages of shopping websites designs consistent
* Add functionality to Basket in shopping website
* Begin visuals for voice control of shopping website
* Write new sections for aim and objectives in final report, with the new changes for the interfaces
* Add functionality to components like on-screen keyboard and menu in notes application
  + Touchscreen options without functionality (flexibility)
* Write Project specification section of report – Add new changes (only 2 interfaces)
  + Also change My UI’s section
* Rewrite target Audience section with feedback from interim report
* Put Navbar for shopping website into react component
* -set up event handlers for buying items

Week 4:

* Complete database interface with functionality
* Report, Literature Review and Background Reading
* Add functionality to voice control in shopping website
* Add customizable menu to notes application
* Write these sections of report
  + Technologies I have used – Add React
  + Add more in depth information to literature review for
    - HCI by Alan Dix
    - Designing the user Interface by Ben Shneiderman
    - Empirical Research in HCI by Scott MacKenzie
  + Edit HCI goals section to reflect new plan
  + Create draft for My progress section, to be finished when interfaces visuals are complete
    - Work completed sub-section
    - Process of design sub-section
    - Designs and HCI principles

Week 5:

* Add Internationalization principle for notes application, Menu which can change the language of the application
* Split old shopping website HTML code into components to be combined later
  + Basket page
  + Settings page
* Colourful web site with images and navigation
* Documentation: Create user documentation and guides to help users understand how to use your application effectively
* Report – write software engineering section
  + Talk about other methodologies I could have used besides UCD and why
  + Also other methodologies other than Agile and why
* Add Loading bar to all pages in shopping website (see system status)
* Add more citations to report
* Add dark mode options to notes application

Week 6 :

* Continue User Manual for the implemented interfaces.
  + Add how to run section to appendix
* Conduct user testing for all UIs, plan to implement main feedback.
* Complete Self evaluation section and critical analysis section of report
  + Discussion of project achievements and over how successful it was
* Complete report (Week 22) and send to supervisor
  + Write conclusion
* Add security to shopping website.
  + Create sign in and sign out pages.
  + Create 2FA page, with timer for sending code.
* Create mobile and tablet versions of shopping website with bootstrap
* Use React DevTools extension to test website and debug

Week 7 – Week 8:

* Implement all feedback of report from supervisor
* Conduct 2nd User interface testing for both interfaces
  + Using selenium for shopping website
  + Add output to report appendix
* Make video of UI’s and add YouTube link to report

Week 9 – Week 10:

* 22nd March, Final report and programs due

Conclusion

This interim report has provided an overview of the progress that has been made on the HCI Project so far. The project is on track to be completed successfully by the deadline.

The research and planning phase has been completed, and the design phase is well underway. A basic website layout has been created, a database has been created for the inventory management system, and a basic shopping website has been created and styled. Swing has also been learned and used to create a basic GUI for the note’s application

The upcoming phases of the project involve a focused continuation of the development process for all three user interfaces (UIs). This entails advancing and refining each UI, ensuring that they align with the established design principles and respond to the diverse needs of their respective user groups.

In parallel, a critical step involves the initiation of usability testing for both the shopping website and notepad application. This testing phase is instrumental in assessing the effectiveness, efficiency, and overall user satisfaction with the interfaces. User feedback obtained through usability testing will serve as a valuable source of insights, offering a real-world perspective on the usability and functionality of the UIs.

Following the usability testing phase, the next critical task is to implement necessary changes to the UIs based on the feedback received. This iterative process is pivotal in refining the interfaces, addressing potential pain points, and enhancing the overall user experience. The adjustments made will be informed by a user-centric approach, ensuring that the UIs are not only functional but also user-friendly and aligned with the preferences and expectations of the target audience.

By systematically progressing through these steps, the project aims to deliver user interfaces that not only meet design objectives but also resonate with users, fostering a positive and effective interaction with the implemented applications.

I am confident that I am on track to complete the project successfully by the deadline. I am looking forward to continuing to work on the project and to learning more about HCI principles and their application to the design of interactive systems.

Bibliography and citations

**Add more citations**

Resources that have helped me prepare this plan:

* [1]. [*Human-Computer Interaction (3rd Edition)*](http://www.amazon.com/gp/product/0130461091?ie=UTF8&tag=hci01-20&linkCode=as2&camp=1789&creative=9325&creativeASIN=0130461091)*, Alan Dix, Gregory D Abowd, Janet E Finlay and Russell Beale***,** this book provides a comprehensive overview of the field of HCI.
* [2].[*https://www.techtarget.com/searchapparchitecture/definition/user-interface-UI#:~:text=Types%20of%20user%20interfaces&text=graphical%20user%20interface%20(GUI),touch%20user%20interface*](https://www.techtarget.com/searchapparchitecture/definition/user-interface-UI#:~:text=Types%20of%20user%20interfaces&text=graphical%20user%20interface%20(GUI),touch%20user%20interface). This article helped me decide which Interfaces I was going to make so I could plan how to make them.
* [3]. *Sinha, Gaurav, Rahul Shahi, and Mani Shankar. "Human computer interaction." 2010 3rd International Conference on Emerging Trends in Engineering and Technology. IEEE, 2010*. This paper is a basic introduction to HCI and talks about the history and how the field has evolved, and what the future of HCI could be.

[4]. [*https://youtu.be/WW1g3UT2zww?si=lgXaFbYio-kMyJAt*](https://youtu.be/WW1g3UT2zww?si=lgXaFbYio-kMyJAt)

* This is a playlist of lectures by Scott Klemmer and is a full course on HCI offered by Stanford University

[5]. [*Designing the User Interface: Strategies for Effective Human-Computer Interaction (6th Edition)*](https://www.amazon.com/Designing-User-Interface-Human-Computer-Interaction/dp/013438038X/)*,*

* This is atextbook on user interface (UI) design. create UIs that are easy to use and pleasurable.

[6]. *MacKenzie, I. S. (2012). Human-computer interaction: An empirical research perspective*. This is a book by I. Scott MacKenzie that provides a comprehensive overview of empirical research in human-computer interaction (HCI). The book is divided into two parts:

* Part 1: Foundations: This part covers the basics of HCI research, including the history of HCI, the human factor, interaction elements, and the fundamentals of science and research.
* Part 2: Methods and Applications: This part covers the different methods used to conduct HCI research, as well as how to apply HCI research findings to the design of new computer systems and interfaces.

[7].[*https://www.creativebloq.com/features/ui-design*](https://www.creativebloq.com/features/ui-design)

* This article provides a comprehensive overview of UI design, covering everything from the basics to advanced techniques. I will use this when designing my UI.

[8]. [*https://www.youtube.com/watch?v=He-1O8Pa4SE&list=PLlGZc17KPrVCGRKtgbdvnGshN8AePlqpd*](https://www.youtube.com/watch?v=He-1O8Pa4SE&list=PLlGZc17KPrVCGRKtgbdvnGshN8AePlqpd)

* This is a playlist that guides you thorough java swing and how to use it to create a good-looking GUI.

[9].[*https://docs.oracle.com/javase/tutorial/uiswing/*](https://docs.oracle.com/javase/tutorial/uiswing/)*.*

* This is the Swing manual and documentation.

[10]. [*https://www.canva.com/*](https://www.canva.com/)

* This is a website which allows you to design anything you need.

[11]. [*https://www.smashingmagazine.com/2008/01/10-principles-of-effective-web-design/*](https://www.smashingmagazine.com/2008/01/10-principles-of-effective-web-design/)

[12].[*https://www.interaction-design.org/literature/article/user-interface-design-guidelines-10-rules-of-thumb*](https://www.interaction-design.org/literature/article/user-interface-design-guidelines-10-rules-of-thumb)

[13]*.* [*https://www.w3.org/TR/WCAG21/*](https://www.w3.org/TR/WCAG21/)

[14]. *Norman, D. A. (2004). Emotional design: Why we love (or hate) everyday things. Basic Books/Hachette Book Group.*

* This Book discusses how emotion influences design and how different emotions affect users when interacting with interfaces. It also talks about design techniques and practices to help convey emotions when designing interfaces.

Appendix

# Diary

Week 2, 25/09/23 - 01/09/23:

Project meeting:

- Talked about my project plan, I need to consider who is going to use my Interfaces. Also, which HCI principles I will use in each Interface. Talk about likelihood of each risk in project plan.

- I have read chapters 1 and 2 of Human computer interaction by Alan Dix.

- I have also created my Project Plan

- Next Week I will begin creating the website interface

- Finished reading paper: Sinha, Gaurav, Rahul Shahi, and Mani Shankar. Human computer interaction

Week 3, 02/10/23 - 08/10/23

- I have read chapters 3 and 4 of Human-Computer Interaction by Alan Dix

- Next week I will begin Part 2 of Human-Computer Interaction by Alan Dix

- I will also add CSS to my website, I may use Bootstrap as just CSS would take very long.

- I have created the designs of all 3 UI's using Canva

- I have Created basic website layout

Week 4, 09/10/23 - 15/10/23

- I have created a basic shopping website and included the styling

- I have also read Part 2 of Human-Computer Interaction by Alan Dix, chapters 5 to 7

- I had some issue learning how to use bootstrap but this video really sped up my progress: https://www.youtube.com/watch?v=-qfEOE4vtxE

- There was difficulty using intellij as my own CSS files would not load into my html website, to fix this I moved all my code to vs code. This seems like a problem with the intellij editor.

- Next week I will begin my database interface, I will first make an empty database using MySQL

- Begun reading and making notes on Designing the User Interface: Strategies for Effective Human-Computer Interaction (6th Edition)

Week 5, 16/10/23 - 22/10/22

- I have begun Learning Swing using this course: https://www.youtube.com/watch?v=Kmgo00avvEw&t=3s

- I have created the database for my inventory management system, as well as the schema for the database

- I have also read chapters 8-10 of Human-Computer interaction

- Next week I will begin the interface for the database and have my meeting

- I have also read and made notes on articles and other resources about: Designing for the Web: An Introduction to Human-Computer Interaction by Jakob Nielsen, https://santhosh-adiga-u.medium.com/jakob-nielsens-heuristics-for-interaction-design-guidelines-for-user-centered-excellence-609b270c7e6a, https://www.heurio.co/nielsens-10-usability-heuristics

- Completed testing for all 3 UIs with users and made notes to implement changes

Week 6, 23/10/23 - 29/10/23

- I have read 10 and 11 of Human-Computer Interaction

25/10/23

Project meeting:

-Explain and justify in my report why I did not use a framework for my websites, or use react

-Justify the modern technologies I have used, e.g. Swing

-Add more to my diary - a few lines everyday

-Look at who’s going to use inventory application and on what devices

- I have begun work on the interim project report

24/10/23

-Watched and made notes on Scott Klemmers lectures. Design Heuristics parts 1 and 2, Visual Design

- I have read chapters 12.7, 13.4, 14.6 of Human Computer Interaction by Alan Dix

- Continued Spring tutorial, parts 7 to 10

25/10/23

-Watched and made notes on Scott Klemmers lectures. Typography, Grids and Alignment, Reading and Navigation, Designing Studies

-Read Summary of chapter 15 of Human-Computer Interaction

-Continued spring tutorial, parts 10 to 15

- Created contents page of report, finalized sections it will include

26/10/23

- I have read chapters 16.2, 16.3, 16.6, 16.7 of Human-computer interaction by Alan Dix

- I will focus on the interim report Next week and make sure I have a draft ready to show to my supervisor before our meeting

-Created draft of introduction and abstract for interim report

Week 7, 30/10/23 - 05/11/23

30/10/23

- Read and made notes on https://www.smashingmagazine.com/2008/01/10-principles-of-effective-web-design/

31/10/23

- Read and made notes on Designing for the Web: An Introduction to Human-Computer Interaction by Jakob Nielsen: https://santhosh-adiga-u.medium.com/jakob-nielsens-heuristics-for-interaction-design-guidelines-for-user-centered-excellence-609b270c7e6a

and https://www.interaction-design.org/literature/article/user-interface-design-guidelines-10-rules-of-thumb

- Begun Home page for Shopping website

- I have also completed HCI by Alan dix

- I have been continuing my interim report

- I have finished the Swing GUI course

- Next week I will continue the report and begin my java Gui for the note’s application

- Finished abstract draft

- Finished introduction draft

- Completed testing for all 3 UIs with users and made notes to implement changes

Week 8, 06/11/23 - 12/11/23

- Created template for GUI application

- Created draft of project specification

- Continued Notes application by adding page and navbar, and making it more visually appealing than first prototype

- Completed draft of literature review

- Completed draft of Aims, objectives

- Made notes for theory section of report

- Remade inventory interface by making new sidebar and navbar more visually appealing, taken away colour from first prototype

- Next week I plan to Complete a draft of the report to give to my supervisor before the end of the week

- I will complete the inventory interface

- Add new front page for shopping website showing preview of items

- Continue notes application, adding toolbar and Tooltips, then adding more hci principles

Week 9, 13/11/23 - 19/11/23

- Created separate shopping basket page for shopping website

- Added placeholder items for inventory system UI

14/11/23

- Completed HCI goals for uis in report

- Finished Target audience section for report

- Completed Section on HCI theory draft for report

16/11/23

- Finished Work completed section draft of report

- Written conclusion for report

- Finished homepage for shopping website

- Begun presentation, decided which sections I am going to have

-Next week I plan to finish my report

- I also plan to remake the homepage basted on feedback from testing

- I will also create the settings page

Week 10, 20/11/23 - 26/11/23

- Created basic structure and layout for Presentation to show to supervisor

- Added new footer section to all pages that has quick links for website

Project meeting

- Add timescale section to report with how I have deviated from the original plan

- Talk more about the theory HCI and change the section with HCI principles to reference back to the theory

- Add more functionality to the websites

- Completed testing for all 3 UIs with users and made notes to implement changes

- I have created the settings page with all of the accessibility options

- I have Added a homepage to the inventory management system

- I have completed the Abstract, aims and objectives, motivation, my progress, work completed, HCI theory and principles, software engineering section for the project report

- Written conclusion and literature review

- Created drafts for presentation, aims and objectives section, background importance of HCI, description of the project

- Next week I plan to add more pages for the shopping website

- Also, I plan to add functionality to the note’s application, e.g. ability to type

- Then I will add functionality to the inventory interface by adding the ability to add and customize inventory’s,

Also adding setting and other extra pages for users where I can implement different HCI principles and methodologies.

Week 11, 27/11/23 - 03/12/23

- Created conclusion, section explain the individual parts of the project, defend and justify decisions, and summary sections of the PowerPoint

- Moved project report to Latex template

- Worked on Notes application by Adding more components such as save, edit etc

- Completed presentation and submitted

- Encountered problems with TDD testing as I was not able to find the buttons that are embedded within menus to test using the robot finder, so I have skipped a few tests for now

- I had problems with assertj for swing testing tdd, so I had to restart the whole notes application using maven and a pom file where I could then put the dependencies for junit 5 and assertj.

- I was unable to activate Junit 5 testing for this project after installing the java extension pack, it would only work in a different project so had to move code to new project.

- For the test where I used robot: https://www.tabnine.com/code/java/methods/org.assertj.swing.core.Robot/finder

- Added more components to the application such as font colour changing and Listeners for all buttons

- Next week I will continue to add more components

- Add screen reading functionality to shopping website, only the interface options

- Add account management for DBMS interface

- And finalise my report to submit next week

Week 12, 04/12/23 - 10/12/23

- I have added a touch screen mode option for notes application and keyboard popup

- I have finalises the theory section of my report

- I have practiced my presentation and made a script

- I have given my presentation at university

- I have had to fix my notes application code as none of the TDD tests would pass, this is because I had used constructors to make the 2 menu bars so the tdd test could not access them. To fix this I

moved the format Menu into the home menu as when it had 2 separate menus the robot. finder could not differentiate between them and test each one.

- Notes app:

Added touch screen mode with mock keyboard.

Added side menu with undo and redo buttons.

Added full screen mode with functionality.

- Database interface:

Made login and signup pages.

Made two factor authentication pages.

Made Cover page.

Changed main dashboard to have inventory items and made submenu for customizing the menus.

Added simple help button and popup in home page.

Contents

[1. Abstract: 5](#_Toc157071751)

[1.1 My UI’s: 6](#_Toc157071752)

[2. Project Specifications: 7](#_Toc157071753)

[2.1 Target Audience 8](#_Toc157071754)

[3. Aims, objectives, and literature survey 10](#_Toc157071755)

[3.1 Technologies I have used and why: 10](#_Toc157071756)

[3.2 Motivations for this project: 12](#_Toc157071757)

[3.3 HCI Goals for my Ui’s: 14](#_Toc157071758)

[4. HCI Theory 16](#_Toc157071759)

[4.1 Background Theory: 16](#_Toc157071760)

[4.2 Literature review: 19](#_Toc157071761)

[5. My Progress so far 21](#_Toc157071762)

[5.1 Work completed: 21](#_Toc157071763)

[5.2 My process of design: 24](#_Toc157071764)

[5.3 Designs and HCI principles: 25](#_Toc157071765)

[5.3.1 Other HCI methodologies I have included in my designs: 33](#_Toc157071776)

[5.4 Software engineering: 33](#_Toc157071777)

[6.Proffesional issues 35](#_Toc157071778)

[7.Timeline with changes 36](#_Toc157071779)

8.[Conclusion 40](#_Toc157071780)

8.1[Self](#_Toc157071780) evaluation of this project………………………………………………………………………………………

8.2 Critical analysis and Discussion…………………………………………………………………………………

[Bibliography and citations 40](#_Toc157071781)

[Appendix 42](#_Toc157071782)

How to run the software…………………………………………………………………………………………………

[Diary 42](#_Toc157071783)

Table of contents and Term 2 Plan

Contents

[1. Abstract: **Error! Bookmark not defined.**](#_Toc157071751)

[1.1 My UI’s: **Error! Bookmark not defined.**](#_Toc157071752)

[2. Project Specifications: **Error! Bookmark not defined.**](#_Toc157071753)

[2.1 Target Audience **Error! Bookmark not defined.**](#_Toc157071754)

[3. Aims, objectives, and literature survey **Error! Bookmark not defined.**](#_Toc157071755)

[3.1 Technologies I have used and why: **Error! Bookmark not defined.**](#_Toc157071756)

[3.2 Motivations for this project: **Error! Bookmark not defined.**](#_Toc157071757)

[3.3 HCI Goals for my Ui’s: **Error! Bookmark not defined.**](#_Toc157071758)

[4. HCI Theory **Error! Bookmark not defined.**](#_Toc157071759)

[4.1 Background Theory: **Error! Bookmark not defined.**](#_Toc157071760)

[4.2 Literature review: **Error! Bookmark not defined.**](#_Toc157071761)

[5. My Progress so far **Error! Bookmark not defined.**](#_Toc157071762)

[5.1 Work completed: **Error! Bookmark not defined.**](#_Toc157071763)

[5.2 My process of design: **Error! Bookmark not defined.**](#_Toc157071764)

[5.3 Designs and HCI principles: **Error! Bookmark not defined.**](#_Toc157071765)

[5.3.1 Other HCI methodologies I have included in my designs: **Error! Bookmark not defined.**](#_Toc157071776)

[5.4 Software engineering: **Error! Bookmark not defined.**](#_Toc157071777)

[6.Proffesional issues **Error! Bookmark not defined.**](#_Toc157071778)

[7.Timeline with changes **Error! Bookmark not defined.**](#_Toc157071779)

8.[Conclusion **Error! Bookmark not defined.**](#_Toc157071780)

8.1[Self](#_Toc157071780) evaluation of this project………………………………………………………………………………………

8.2 Critical analysis and Discussion…………………………………………………………………………………

[Bibliography and citations **Error! Bookmark not defined.**](#_Toc157071781)

[Appendix **Error! Bookmark not defined.**](#_Toc157071782)

How to run the software…………………………………………………………………………………………………

[Diary **Error! Bookmark not defined.**](#_Toc157071783)

**Term 2**

Week 1 (Starting 15/1/2024):

* Begin on affordance features in for shopping website
  + And visual effects for help menu guiding you through the interface
* Put dashboard page of inventory interface into a function for react

Week 2 – Week 3:

* Add functionality to Basket in shopping website
* Begin visuals for voice control of shopping website
* Write new sections for aim and objectives in final report, with the new changes for the interfaces
* Write Project specification section of report – Add new changes (only 2 interfaces)
  + Also change My UI’s section
* Rewrite target Audience section with feedback from interim report
* Put Navbar for shopping website into react component

Week 4:

* Report, Literature Review and Background Reading
* Add functionality to voice control in shopping website
* Add customizable menu to notes application
* Write these sections of report
  + Technologies I have used – Add React
  + Add more in depth information to literature review for
    - HCI by Alan Dix
    - Designing the user Interface by Ben Shneiderman
    - Empirical Research in HCI by Scott MacKenzie
  + Edit HCI goals section to reflect new plan
  + Create draft for My progress section, to be finished when interfaces visuals are complete
    - Work completed sub-section
    - Process of design sub-section
    - Designs and HCI principles

Week 5:

* Add Internationalization principle for notes application, Menu which can change the language of the application
* Colourful web site with images and navigation
* Documentation: Create user documentation and guides to help users understand how to use your application effectively
* Report – write software engineering section
  + Talk about other methodologies I could have used besides UCD and why
  + Also other methodologies other than Agile and why
* Add Loading bar to all pages in shopping website (see system status)
* Add more citations to report
* Add dark mode options to notes application

Week 6 :

* Continue User Manual for the implemented interfaces.
  + Add how to run section to appendix
* Conduct user testing for all UIs, plan to implement main feedback.
* Complete Self evaluation section and critical analysis section of report
  + Discussion of project achievements and over how successful it was
* Complete report (Week 22) and send to supervisor
  + Write conclusion
* Create mobile and tablet versions of shopping website with bootstrap
* Use React DevTools extension to test website and debug

Week 7 – Week 8:

* Implement all feedback of report from supervisor
* Conduct 2nd User interface testing for both interfaces
  + Using selenium for shopping website
  + Add output to report appendix
* Make video of UI’s and add YouTube link to report

Week 9 – Week 10:

* 22nd March, Final report and programs due