



2022 Project

Title:

The second-hand trading system for Cardiff University students

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Abstract

With the popularity of the Internet, e-commerce business has developed more and more rapidly. People can place orders and pay for all kinds of goods on the website anytime, anywhere. At the same time, the second-hand trading market has gradually entered people's field of vision as an emerging e-commerce category. Modern consumerism has increased tremendously in line with economic development. While this has greatly increased the dynamism of the market, it has also led to a huge accumulation of unused items that consumers do not use at the moment or that are obsolete for them. The second-hand market has emerged as a means of disposing of these unused items. At present, a large number of companies have created second-hand commodity trading platforms. In China, well-known trading platforms include xianyu, owned by Alibaba, and in the UK, ShpockShpock is already the most popular platform of the moment. However, these platforms have some problems, such as frequent fraud, complex user population, and poor convenience. The purpose of this project is to analyse the problems existing in the existing second-hand trading platforms, propose improvement measures and develop a second-hand trading platform for Cardiff University students that can solve such problems. To allow users to enjoy the convenience brought by the second-hand trading platform while ensuring security, and to bring users the best trading experience. Based on the above objectives, the project has conducted a lot of research into the technical solutions, and after detailed research chose to use the classic development framework of spring boot & html, and completed the development of the complete project based on prototype drawings. The project also explored the security issues and came up with constructive solutions, including functional and non-functional means such as banning online payments and limiting the identity of registered users. As a conclusion, this project has built a student-oriented second-hand trading platform that guarantees a user-friendly second-hand trading experience and provides strong security.

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Chapter One: Introduction

1.1 Research background

While the Internet has been serving mankind for 40 years, it is within the last two decades that the Internet boom has occurred. Modern instant messaging software and the development of e-commerce are important reasons for this outcome. The promotion of e-commerce to the market economy has advanced the internet industry and it has been reported that in 2018 the e-commerce market in the UK alone overtook brick and mortar shops as the main vehicle for retailing (2018, CEBR).

Over the past six years, internet sales have nearly doubled as a percentage of total market retail sales (Shieldpay, 2018). More and more retailers and wholesalers are beginning to shift their sales fronts from offline to online. This is due to its user-friendly nature, and it saves users' shopping time and saves them from having to travel offline to achieve their shopping needs. This type of e-commerce is gradually becoming the dominant means of retailing sought after by users. This in turn has driven more and more businesses to join the e-commerce bandwagon. At the same time, attitudes towards unused items have also changed with the growth of e-commerce. In the past, unused items were difficult to dispose of as matching them to a desired buyer was a very time consuming and laborious task. However, these items are in many cases difficult to dispose of. For example, for graduating students, a large number of items that have some value are difficult to take with them when they graduate, but would be very wasteful if they were thrown away. In the age of e-commerce, this problem has been solved, as people no longer need to spend time looking for the right buyer, but simply post the item and wait for the buyer to come to them. There is a vast market for second-hand goods that is waiting to be discovered in the age of e-commerce.

A considerable number of second-hand trading platforms have already flooded the market, and the mainstream platforms usually allow anyone to become a user on them, while generally not being overly vetted for goods (Alibaba annual report, 2021). This is because such platforms need to be targeted at all potential users. While such an

operational mindset can lead to a large volume of traffic and merchandise, it can also lead to some potential information security issues and fraudulent incidents. For the student population in particular, these information security and fraud issues can lead to worse consequences. A large number of students are also reluctant to buy or sell second-hand items because they have been scammed or do not trust these platforms. The aim of this project is to use technology and operational methods to provide the student community at Cardiff University with a second-hand trading platform that is both convenient for buying and selling, and free from security risks.

1.2 Research aim and objectives

As described in sec1.1, the current second-hand trading platform has a number of disadvantages that are not conducive to use by the student community. The aim of this project is to provide students at Cardiff University with a second-hand marketplace that is both convenient and secure. Convenience means that users can find what they are looking for as quickly and easily as they can on other second-hand trading platforms. Security means that users are free from the fear of unpredictable situations such as personal information leaks and buyer/seller scams when posting or buying products.

The paradox of security and convenience is a constant topic in Internet software development sessions. It was pointed out in the e-commerce development report that securing data and transactions would inevitably come at the expense of user experience (2016 Ding D). This problem is particularly evident in e-commerce platforms. As convenience implies the need for a large number of sellers to post their products and for these products to be unchecked by the administrators, while security requires a higher barrier to entry for users to register and a greater level of monitoring by the administrators of user behaviour and product postings. The aim of this project is to balance this security and convenience by using appropriate technical and non-technical means to provide a second-hand trading platform for students of Cardiff University.

To accomplish the above aim, the following objectives are established.

1. To fully research the characteristics of existing second-hand trading platforms and collect feedback from users of the corresponding platforms
2. To analyse the differences between the current situation of the existing second-hand trading platforms and the demands of student users, taking into account user feedback and research results, and to identify the improvements that should be made to the platform
3. Refine the requirements of the platform, clarify the functional and non-functional requirements, draw prototype diagrams and complete the technical selection according to the requirements
4. Complete the development process based on the prototype and the selected technology

1.3 Dissertation structure

This dissertation consists of the following chapters: The first chapter has outlined the research background, aim and objectives. Chapter 2 focuses on reviewing related work on the market and the technology of the second-hand trading platform, and this chapter also identifies the approaches adopted in this project. Chapter 3 presents a complete analysis of the existing second-hand trading platform. Chapter 4 covers the preparation of the product for development, which includes the design of the prototype and the code framework. Chapter 5 is devoted to the implementation and presentation of the product and contains a detailed analysis of the design concepts and functions of the various pages and interactions. Chapter 6 delivers the conclusions and the author's reflections.

Chapter Two: Related work and Research Approach

2.1 Overview of the online trading

With the development of e-commerce, online transactions are becoming more and more integrated into people's lives, with transaction amounts constantly breaking new ground.

The share of internet sales as a percentage of total retail sales has doubled over the last 6 years. The retail market is shifting online and consumers who are pushing the change in the sector due to the obvious time savings and overall convenience (Mahadevan, 2000). With the development of e-commerce, more and more commodities have been transformed from real transactions to virtual transactions. The UK business-to-consumer e-commerce market accounted for a total value of €178.5 billion in 2018, a figure close to 34% of total European e-commerce. E-commerce is increasingly becoming a leader in the retail market. Second-hand goods trading website also provides a broader platform for this kind of trading mode (Xiaosen and WEN, 2015).

2.2 Introduction of online second-hand trading

The application of second-hand trading, an online transaction, has long been in the spotlight. According to a survey released by Alibaba in 2019, almost everyone (98%) has unused items, while more than half of users tend to let their unused items sit aside and not dispose of them. The reason for this situation is that most users consider selling their unused items to be a hassle, while a smaller half are unsure where to go to sell their unused items. A survey on the second-hand market has also been conducted by the British Statistical Institute (BSI, 2020). The data shows that 75.9% of respondents in the UK have used second-hand trading platforms; on these platforms, respondents are more likely to buy and sell electronics (61.0%) and books (45.2%); respondents' biggest concerns are the difficulty of guaranteeing quality (56.0%), fraudulent money (45.6%) and items falling through the cracks (43.3%); 64.2% of respondents believe that the use of third-party guaranteed payments. Regarding the significance of second-hand trading

platforms, 67.7% of respondents believe that they help recycle and reuse resources, 57.3% of respondents said that they can also perform the function of making friends through trading second-hand items, 41.1% of respondents believe that this move makes the concept of environmental protection more impressive, and 39.4% of respondents believe that second-hand platforms allow them to buy more cost-effective items. It is easy to see, therefore, that there is a broad market for second-hand transactions, driven by the high level of convenience and better security.

As students' purchasing power and ability to pay increases, it is likely that they will purchase products for enjoyment during their time at school. This results in every student having some under-utilised unused items in their possession. While this is not a significant problem when students are at school, when they move and graduate, this clutter can be a major problem as it is a shame to throw them away and they simply take up space. However, these items may be exactly what is needed for other students. As a result, second-hand goods trading has become a popular topic among students today.

There are already many pioneers who have set up sophisticated online second-hand trading platforms. Examples include letgo, a software often used by Americans, and xianyu, a software often used by the Chinese. xianyu, for example, is a mobile second-hand trading platform launched by alibaba in 2014. It is a regulated marketplace for trading idle items - not only does it support a variety of secure same-city and online secured transactions, but it also has a professional third-party service provider so that users can trade idle items on xianyu with confidence. Its highlights include the following.

1. Extremely easy selling and buying. From the time a user attempts to post an unused item to the time it is completed, it usually takes no more than three clicks and jumps. The instructions on the page are also very clear when you as a buyer are trying to

establish contact with a seller, and you can easily complete the exchange.

2. There is no barrier for users to join and there is a huge volume of users and products. As a national app, any individual with basic identification information can apply to become a user on it, which brings a huge amount of life and merchandise stock to xianyu.

A statistical report by bigData-research shows that since 2019, the scale of idle goods trading in China has started to grow steadily, with xianyu having the clear highest user activity and the number of users coming in at 24,399,000(bigData Research 2019). A total of greater than 1.4 billion idle items have now been posted on xianyu. The average daily user activity is over 1 million and the average daily number of unused items posted is over 2 million. The GMV of xianyu is close to RMB 90 billion and is about to break the RMB 100 billion mark.

However, the above praise for xianyu does not disguise the fact that it has a large number of problems. The highlights listed in this article have, at times, become flaws. According to Chinese public security authorities(CN security authorities 2021), in March 2021 alone, 228 people in one Chinese province were defrauded in xianyu for making transactions, with losses amounting to RMB 2,741,800, with the highest loss in a single case amounting to RMB 900,000. Of these, 101 men were defrauded, 127 women were defrauded and 24 were minors under the age of 18. In the first twenty days of January 2022, another 32 scams originating from xianyu occurred in the province. More than half of them were students, with an average of two cases occurring in three days.

These figures reveal a significant fact: easy transactions and no threshold for user access inevitably create a major mixed phenomenon. It is highly likely that ill-intentioned users will take advantage of the ease of registering an account to commit fraud on the platform - because anyone can register. Likewise, the ease of paying online means that fraudulent funds are difficult to recover, and fraudsters can easily get away with it, even registering accounts again after a period of time using new identity information.

According to incomplete statistics from regulatory platforms, as many as 62% of purchases on second-hand platforms were made with shoddy products/graphics that did not match, and about 18% experienced scams. Of these, 72% of those who made these reports were student groups(E-Commerce Report 2019). This is a good indication that there is some room for improvement in the existing platforms in terms of information security, property protection and user screening. Especially for students, who lack sufficient financial resources to protect themselves, the use of existing second-hand trading platforms may expose them to significant risks.

This project aims to address the above-mentioned problems in the second-hand market and adopt a more refined user registration strategy and more standardised regulations to address the risks. The project aims to develop an online second-hand trading system that matches the needs of students and safeguards their information and property.

2.3 Adopted Approaches and Technologies

As a development project, developers need to have a thorough understanding of the technologies used to develop a platform. This section will provide an overview of the technologies that are required.

2.3.1 Front End

Front-end development is the development of content presentation and user interaction on a web page or software.

Content presentation refers to the information seen on a web page such as images, text, video, figures etc. User interaction on the other hand refers to the user providing data input to the website by clicking buttons, entering text and other actions on the page, and then the front-end responding to the user's input.

The most mainstream front-end page is the user interface interaction of Internet products through HTML, CSS and JavaScript and the various technologies, frameworks

and solutions derived from them. It evolved from web authoring and has a very distinctive era in its name. In the evolution of the Internet, web authoring was a product of the Web 1.0 era, when the main content of early websites was static, with images and text as the main focus, and the user's behaviour with websites was mainly browsing. With the development of Internet technology and the application of HTML5 and CSS3, modern web pages are more beautiful, with significant interactive effects and more powerful functions. The mobile internet has brought a large number of high performance mobile devices and fast wireless networks, HTML5, node.js is widely used, and various framework libraries are emerging. The mainstream technologies currently on the market include a variety of frameworks based on java script, as well as architectures in traditional languages such as java and python. These architectures have different characteristics, and they are suited to different scenarios. Therefore, it is worth exploring the various technical architectures involved. The process of selecting a technology based on the characteristics of the online shop being developed will be described in detail later on. In this section several cutting-edge technologies are presented and their characteristics, advantages and disadvantages are analysed.

No matter how much technology changes and no matter how simple and easy to use the newly generated frameworks are, the three core modules of front-end technology remain the same: html, CSS and JavaScript (Zhang, 2017).

HTML is a markup language, mainly consisting of tags with special meanings (building structure), and the so-called HTML is an abbreviation for "Hypertext Markup Language". Most of the web pages we see on the Internet are written in HTML. "Hypertext" means that a page can contain images, links, and even non-textual elements such as music and programs. The term "markup" means that this hypertext must be marked by an opening and closing flag containing attributes. Browsers decode HTML to display the content of web pages, and it forms the basis for the rise of the Internet.

CSS is a descriptive language, consisting mainly of a set of selectors (html elements) and attributes (external and internal decoration of buildings)

Cascading Style Sheets (CSS) is a computer language used to represent the style of documents such as HTML (an application of the Standard Generalized Markup Language) or XML (a subset of the Standard Generalized Markup Language). CSS can not only statically decorate web pages, but can also be used with various scripting languages to dynamically format the elements of a web page

JavaScript is a scripting language that contains a java-like syntax (data types, arrays, conditional branching, loops, objects), it is a straightforward scripting language, a dynamically typed, weakly typed, prototype-based language with built-in support for types. Its interpreter, known as the JavaScript engine, is part of the browser and is widely used as a client-side scripting language, first used on HTML pages to add dynamic functionality to HTML pages.

Based on these technologies, more and more front-end frameworks are coming to the forefront to improve coding efficiency and extend the functionality of the page. Some of the most mainstream ones include react, node.js and JSP (Introduce of Frame, 2015).

React is a JavaScript library for building user interfaces. React started as an internal project at Facebook to build the Instagram website and was open sourced in May 2013. react has a high performance and very simple code logic and more and more people have started to look at and use it.

Known for requiring minimal coding effort, React is a tool that focuses on developing effective user interfaces (UI) to help anchor applications across all platforms. Front-end developers also acknowledge that this tool is SEO friendly compared to other traditional heavy JavaScript frameworks.

ReactJS creates applications that are very easy to read and helps developers to debug the code at any time with the help of native tools. The applications developed have more functionality and they are easier to maintain thanks to the reusable code components. When front-end developers use ReactJS, creating dynamic and constantly changing applications becomes more manageable, as other tools require complex coding.

A small team can easily use this front-end technology and, when using it, there is only a one-way flow of data. This in turn provides a stable code and the resulting interface is more popular. It is extremely suitable for lightweight products.

Node.js is an open-source cross-platform library for server-side programming that helps developers to build web applications smoothly and quickly. By deploying Node.js, we can easily execute web applications or JavaScript applications with its basic modules that are specifically inscribed in JavaScript.

JSP (or JavaServer Pages) is a dynamic web technology standard created under the leadership of Sun Microsystems, Inc. JSP is deployed on a web server that responds to requests sent by clients and dynamically generates web pages in HTML, XML or other formatted documents based on the content of the request, which are then returned to the requester. technology uses the Java language as a scripting language to serve HTTP requests from users and can work with other Java programs on the server to handle complex business requirements.

2.3.2 Back End

Back-end development is all about what users don't see on the page. This includes: the logic of user behaviour, data access services so that the front end can add, delete, check and change data by calling back-end services, thus enabling the front end to respond to user requests.

The scope of work is very wide, a few of the more common is to design the API of the back-end service, design the architecture diagram of the back-end service, design the database of the back-end service, write code to implement the business logic of the back-end service, but also need to ensure that the design of the back-end service is highly available, when the number of accesses is very high still keep not down. It is also necessary to ensure that the response time for user requests is short, the throughput is high and the number of requests per unit of time is high, etc.

Back-end development is based on languages and frameworks, and this section focuses on a few common development languages and their corresponding frames

2.3.3 Language

The C language was originally used for system development work, particularly for the programs that make up operating systems. C was adopted as the system development language because the code produced by C ran at almost the same speed as code written in assembly language. Currently, C is the most widely used system programming language. Most advanced software is implemented in C.

C++ is the successor to C and is a very widely used computer programming language. C++ is a static data type-checking, multi-paradigm general-purpose programming language that supports a variety of programming styles including procedural, data abstraction, object-oriented, generic and principle-based design. C++ is not only useful for efficient computer operation, but also for improving the quality of programming and problem description in large-scale programs (C++ primer,2006).

Java is an object-oriented programming language that can be used to write cross-platform applications. It is available as Java SE (Java Platform, Standard Edition) for desktop applications, Java EE (Java Platform, Enterprise Edition) for web applications, and Java ME (Java Platform. Micro Edition) for mobile applications and embedded applications, Micro Edition) for mobile applications and embedded development.

Java is still the most popular back-end development language for most businesses, but it is more difficult and heavier to develop in Java, so it is suitable for large enterprise level projects.

Python is an object-oriented, interpreted computer programming language. It is pure free software, source code and interpreter, and Python has a clean and clear syntax, featuring a mandatory white space indentation. Often nicknamed the glue language, it can easily link together various modules made in other languages (especially C/C++).

A common application scenario is to use Python to quickly prototype a program (and sometimes even its final interface) and then rewrite parts of it in a more appropriate language for specific requirements, such as a graphics rendering module in a 3D game with particularly high-performance requirements, which can be rewritten in C/C++ and then wrapped into an extension library that Python can call.

Django is an open-source web application framework, written in Python. It uses the MTV framework model of Model M, View V and Template T. It was originally developed to manage a number of news content-based websites owned by the Lawrence Publishing Group, i.e. as CMS (Content Management System) software.

2.3.4 Frameworks

Before we get into the specifics of cutting-edge back-end development frameworks, it is important to know what is meant by 'framework'.

A framework is a reusable design for an entire or partial system, expressed as a set of abstract building blocks and methods of interaction between instances of the building blocks. Another definition of a framework is that it is a customised application skeleton or development template for application developers, a framework is a reusable design artefact that specifies the architecture of an application, clarifying the entire design, the dependencies between collaborative components, the allocation of responsibilities and the control process. For back-end developers, using a framework means not spending a lot of time structuring code or spending time on orchestrating code. A proper framework means that the developer only needs to focus on calling the right APIs to achieve the required functionality. For back-end development, it is therefore vital to choose the framework that meets the needs.

As java is the most popular language for back-end development, java-based frameworks are the most popular and mature in the market. java spring is one of them.

Spring is a lightweight open-source framework in the field of Java EE (java enterprise

development) programming, the framework was first proposed by a programmer named Rod Johnson in 2002 and subsequently created as an application-based framework to address the complexity of enterprise-level programming development and achieve agile development (java Spring 2016). Spring is an open-source container framework that integrates various types of tools to achieve the underlying class instantiation and lifecycle management through the core bean factory. Throughout the framework, various types of functionalities are abstracted into individual beans, which allows the management of various functions, including dynamic loading and tangent programming. Spring was the most forward-thinking at its inception for a number of reasons.

It positions itself in areas that many other popular frameworks do not. spring is committed to providing a way to manage your business objects.

Spring is comprehensive and modular. spring has a layered architecture, which means that you can choose to use any part of it in isolation and its architecture remains inherently stable. For example, you might choose to use Spring just to simplify the use of JDBC, or to manage all your business objects.

Designed from the ground up to help you write code that is easy to test, Spring is the ideal framework for test-driven engineering.

Spring does not require more than one framework for your project. spring is a one-stop solution that is targeted at most of the infrastructure associated with a typical application. It also addresses elements that other frameworks do not take into account.

It is designed to simplify the initial build of new Spring applications and the development process. The framework uses a specific approach to configuration so that developers no longer need to constantly define sample configurations as is the case with spring. In this way, Spring Boot aims to be a leader in the burgeoning field of rapid application development.

SpringBoot is based on Spring 4.0 and not only inherits the best features of the Spring framework, but also simplifies the whole process of building and developing Spring applications by simplifying configuration (Spring Boot in action, 2016). SpringBoot

also integrates a large number of frameworks to make the dependency package version conflict, and reference instability problems are well solved. spring boot's advanced features are reflected in the following aspects.

The ability to create standalone Spring applications and, based on its Maven or Gradle plug-ins, to create executable JARs and WARs.

Embedded Servlet containers such as Tomcat or Jetty.

Providing an automatically configurable "starter" project object model (POMS) to simplify Maven configuration.

Automatic configuration of the Spring container where possible.

Providing ready-to-use features such as metrics, health checks and externalised configurations.

Absolutely no code generation, no XML configuration required

The most superior aspects of the SpringBoot framework are reflected in its two strategies: out of the box and convention over configuration. out of box, means that during development, the object lifecycle is managed by adding relevant dependency packages to the MAVEN project's pom file and then using the corresponding annotations instead of cumbersome XML configuration files. This feature frees developers from the complexities of configuration and dependency management and allows them to focus more on business logic. Convention over configuration, a software design paradigm where SpringBoot itself configures the target structure and the developer adds information to the structure. This feature reduces some of the flexibility and increases the complexity of bug location but reduces the number of decisions developers need to make, reduces the amount of XML configuration, and automates the work of compiling, testing and packaging code.

The vast majority of applications that require rapid iteration and the businesses they work for today use java spring boot, and its superiority makes it the most popular back-end development framework on the market today.

Languages other than java certainly have some cutting edge development frameworks. However, as they are less relevant to this project, only a brief overview is given below.

Django is a lightweight framework based on the python language. Django provides modules that are often used to develop websites with a large amount of common code pre-configured. By reducing repetitive code, Django allows users to focus on the key things of interest on web applications. To achieve this, Django provides a high level of abstraction of common web development patterns, quick solutions to frequently performed programming tasks, and clear and unambiguous conventions for "how to solve problems". Yourself) to encourage rapid development!

2.3.5 Relational Database

MySQL is one of the most popular relational database management systems and is one of the best RDBMS (Relational Database Management System) applications for web applications. The SQL language used by MySQL is the most common standardised language used to access databases.

Chapter Three: Problem identification

3.1 Current state of the second-hand market

In chapter, the advantages and disadvantages of the mainstream secondary market are described in full. The main aspiration of these platforms is to make a profit, so they do not give much thought to security. This can be overwhelming for students.

The need for second-hand trading among the student population is real and therefore many attempts have been made to address this issue. For example, universities or communities have organised themselves into second-hand trading marketplaces using social software as a vehicle. A typical example is the spontaneous formation of second-hand trading groups on university campuses or community properties, which combine the information matching model of online second-hand trading platforms with the offline flea market feature of trading items in person, forming a marketplace for a fixed group of people.

This type of trading is done by placing information about items that you need or are unused in the school second-hand group, known as "listing unused items" or "seeking items". The information transfer of on-campus second-hand transactions mostly relies on chat platforms, which have their own characteristics compared to professional second-hand trading platforms.

(1) You need to be pulled in by an acquaintance to enter the group chat, which largely prevents unidentified outsiders from affecting the community environment, thus ensuring security and reliability to a certain extent.

(2) The information about the products appears in a timeline, without unnecessary publicity, which has a certain impact on the circulation of the products.

(3) Chat platforms generally come with their own search function, which to a certain extent can satisfy the search for goods, but the search function of chat platforms is a precise capture of characters, with a large margin of error, and there is also a lot of interference from information that has already been completed for transactions.

On the whole, this approach does, to some extent, solve the problems posed by professional online trading platforms: it is difficult to identify people and security cannot be guaranteed. But it also sacrifices the benefits of a professional platform: ease of retrieval and ease of trading. This is clearly not an optimal solution.

Clearly, students need to enjoy the most convenient transaction experience while remaining as secure as possible. The best solution is to be able to use the same website/software architecture as the professional platforms while ensuring that registered accounts need to be vetted. If a tool existed that ensured that only students could join, but had a similar experience to xianyu, the problem would be solved. This project will provide a specific requirements analysis to address these needs.

3.2 Requirement analysis

Based on the above analysis of the existing second-hand market, the requirements of this project will be divided into basic and improved functions. The basic functions are the basic functions that are needed to meet the needs of the online second-hand trading platform, such as posting, buying and browsing. The improved functions are the functions that can be implemented to compensate for the shortcomings of the existing second-hand marketplace. Also, this section outlines non-functional requirements that ensure user safety, reliability, aesthetics and interaction reliability when not presented as functionality.

3.2.1 Basic functions

As described in section 2.2, the core functions of the second-hand marketplace are to satisfy users' needs for browsing, buying and posting of products. In addition to this, a number of matching user requirements will be listed below.

0. Users will be able to log in or register on this page

- 1: Users will be able to browse our specific product categories on the homepage, which include clothing, bags, sports accessories, electronics, lifestyle, books, transport, other, etc. All these second-hand items are urgently needed by users.
2. Users will be able to select to enter a particular product category, which will contain all the items in the category title selected by the user. Except for the items included, the presentation is no different from the home page
3. Users can browse products without being logged in and can click on "buy" products without being logged in, but after clicking on buy, the registration/login interface will pop up
4. Users can search for products in any category (including the home page) and the search will be fuzzy
5. Logged in users will have a "user personal information page" which should contain basic personal information about the user such as name, age, email etc.
6. The user's personal information described in 5 can be modified, but not left blank, as this information is needed to establish a relationship with the user.
7. The user will be able to post products, which will require information to be entered by the user
8. The user's personal information page will list the products that the user has posted.
9. On this page, it is necessary to have an administrator account, whose main tasks include reviewing the user's products for compliance with public order and morals, for violation of laws and regulations, or for threats to public safety.
10. Products that have been approved by the administrator will be displayed in the product category to which they belong, and all products will come from the user's posting.
11. Users can take down their own products and these taken down products will not be displayed on the site nor in the user's

12. If a user acts against the rules, the administrator will be able to delete the user's account
13. Users can add products to their shopping cart from the product browsing page
14. Users can choose to buy directly from the product browsing page
15. Users will be able to pay directly on the shopping cart page to go to the payment page. Selecting direct purchase will also take you to the payment page. The payment page will generate the order for the user

3.2.2 Improved functions

The software that satisfies the above features will be available as a second-hand trading platform, however, the above features are only a replication of existing second-hand trading platforms and do not address the current conflict between efficiency and security.

Therefore, the platform will be designed with the following additional features to meet the additional requirements of the student community for the second-hand trading market

1. Restrictions on registration permissions: In this platform, registration requires a Cardiff University email address as credentials. Applications with a non-Cardiff email address will not be accepted. This feature will ensure that all users of the platform are students and can be directly linked to the user's identity based on their email address, which will effectively protect the rights of the user and ensure accountability when problems arise.
2. Administrator rights: The administrator will regularly review the existing products and user behaviour. When a product has security risks, or a user is deemed to have fraud or other bad behaviour, the user or product will be directly banned/offline.
3. Chat system: When buyers and sellers disagree about product details, product prices and other issues, they can use the chat system in this project to contact each other, and the information from this chat can be stored for a long time to protect the rights and

interests of buyers and sellers' communication

4. Home page recommendations: the latest product information from users will appear on the home page, which contains the type of product posted and its content. Interested users will be able to go directly to the product page and browse the product details. This ensures that users can browse the second-hand marketplace more efficiently and help them to find the products they need quickly.

3.2.3 Non function

1. Aesthetics of the interface. The target audience for this page is the student community, and the young student community has arguably the highest aesthetic requirements of any user group. Especially with the highly developed artwork technology available, a clean and beautiful interface helps to attract users to use your software for a long time. Therefore, a beautiful and professional interface with a clear thematic layout is an important factor that should not be overlooked for this project.

2. Security. Security is a non-functional requirement that is vital to a trading platform. Security here includes not only transaction security that enables users to deal with risky sellers, but also privacy security and data security that involves users' personal information. As this project involves payments and transactions, it is necessary to minimise the flow of faulty products into the platform through administrator review and to remove account access for users with bad behaviour. Also, this project involves a large amount of user information, including personal data such as phone numbers and email addresses, as well as chat logs stored in the chat function. These are protected by the security mechanisms configured by spring boot's containerised deployment to ensure that the data is not leaked. The database used in this project will be stored locally, so the risk of leakage will be further reduced.

3. Ease of use. As a second-hand trading platform for trading, a simple operation for the user should be able to achieve what he wants to accomplish. No user has time to spend a lot of time learning how to use a trading software, so the interaction should be simple

enough to save the user time.

3.3 Technical selection

In the process of selecting a development technical, several expectations should first be defined, among which the following should be focused on.

Define the type of product. Is it a data-intensive application or an interface-centric program? Is its functionality primarily static or interactive? At this stage, analyse the needs of your competitors, your market and your end users.

Define the area. It is important to know where the product will be used: in a specific area, nationally or internationally. The larger the area, the more carefully you need to consider the architecture and technical solutions.

In this project. The second-hand trading site we needed to produce was an interface-centric program. User clicks and interactions are the core functions of the entire application.

At the same time, the online trading platform project will not be used by people on a large scale, all users will be Cardiff School students and although we have overseas students, by and large there are more people from the UK than from other regions.

Based on these product and user characteristics, this sub-section analyses the advantages and disadvantages and assesses the suitability of each of the technologies mentioned in sec 2.3, and gives the final choice of technology and the reasons for it.

Front-end

In section 2.3, the main technologies used for front-end development are the html/css/JavaScript suite, node.js, react and jsp.

As mentioned earlier, both node.js and react are essentially html/css/javascript based, except for the jsp front-end which relies heavily on XML for implementation. Therefore, the first comparison to be made is between XML and html/css/javascript.

xml is characterised by a lack of emphasis on actual communicative use, shifting the focus of the language from decorating applications to processing data. Its focus is on conveying information, data exchange and web computing. Whereas html is the opposite, it is more concerned with the form of the page and appearance is its more focused nature. As an online second-hand trading platform, a good interface can go a long way towards retaining users and increasing the time they are willing to spend browsing the products. The storage and exchange of data is less important for a page with a limited number of views. Therefore, html is clearly the more appropriate choice.

The further choice is between the base option, react, and node.js. The disadvantages of react are undoubtedly significant: for one thing, the smallest unit of reuse it can use is the component. This feature works well for static and simple pages; however, it can be disastrous if the page has an interactive nature, i.e. if the user needs to access multiple connections to fulfil their needs when viewing the page. This increases the amount of coding and complexity of the code, as these events need to be handled by passing callback functions between components. On top of this, React's virtual DOM algorithm, which is mentioned in sec2.3 as its significant advantage, has a huge problem: it works slowly and with very little precision. More importantly, it is neither complete nor robust when it comes to compatibility with HTML templates. When developers try to precisely adjust the layout of a composition, react is difficult to achieve.

Similarly, node.js suffers from the same problem. Although it is a good improvement on react in terms of efficiency and coding complexity, it sacrifices the completeness of the html-related components to a greater extent. Also, its biggest drawback is its extremely low reliability; if one part of the code breaks, the whole system will crash. This is intolerable for a second-hand marketplace software that requires stability.

In contrast, basic html/CSS/JavaScript does not suffer from many of these problems. The various components are easily reusable, while the coding reliability is high. More importantly, it is far less expensive to learn than the frameworks mentioned above, so in this project, the front-end development part did not use any framework, but was

based on html/CSS/JavaScript only.

Back-end

In terms of the choice of back-end, the main concerns for this project were a small amount of information interaction and a framework that would enable rapid development. At the same time, it was necessary to ensure as much compatibility and responsiveness as possible.

The advantages of spring boot over spring itself need no elaboration, as stated in sec2.3, spring boot itself is an integrated and upgraded version of spring. Compared to django, spring boot has better performance in presentation and is extremely suitable for projects with separate front and back ends. And, because of its ability to work with large projects, it performs well with small amounts of data and high levels of interaction.

To improve development efficiency, the project also introduces themyleaf, a powerful java templating engine that adapts well to HTML prototypes and displays pages well, with a default configuration provided by SpringBoot for Thymeleaf and a view parser for Thymeleaf, so Thymeleaf integrates perfectly with Spring Boot. In addition, using this template engine also helps spring boot to integrate smoothly with mybatis, which is a great way to help this project establish a connection to the database. As a result, this option can significantly reduce the complexity of the code architecture.

Database

The reason for choosing MySQL among the many relational databases is that it is free and can be used on any platform with a relatively small footprint compared to the popular mainstream databases Oracle and SQL Server.

Chapter Four: Prototype and design

4.1 Tool supporting

Operating System Software: Windows 10

Database Software: MySQL and Navicat

Integrated development software: Idea 2022

Spring Framework: SpringBoot provide by Maven

Web Browser: Microsoft Edge

4.2 System structure and prototype

4.2.1 System structure overview

This module focuses on the structure of the system

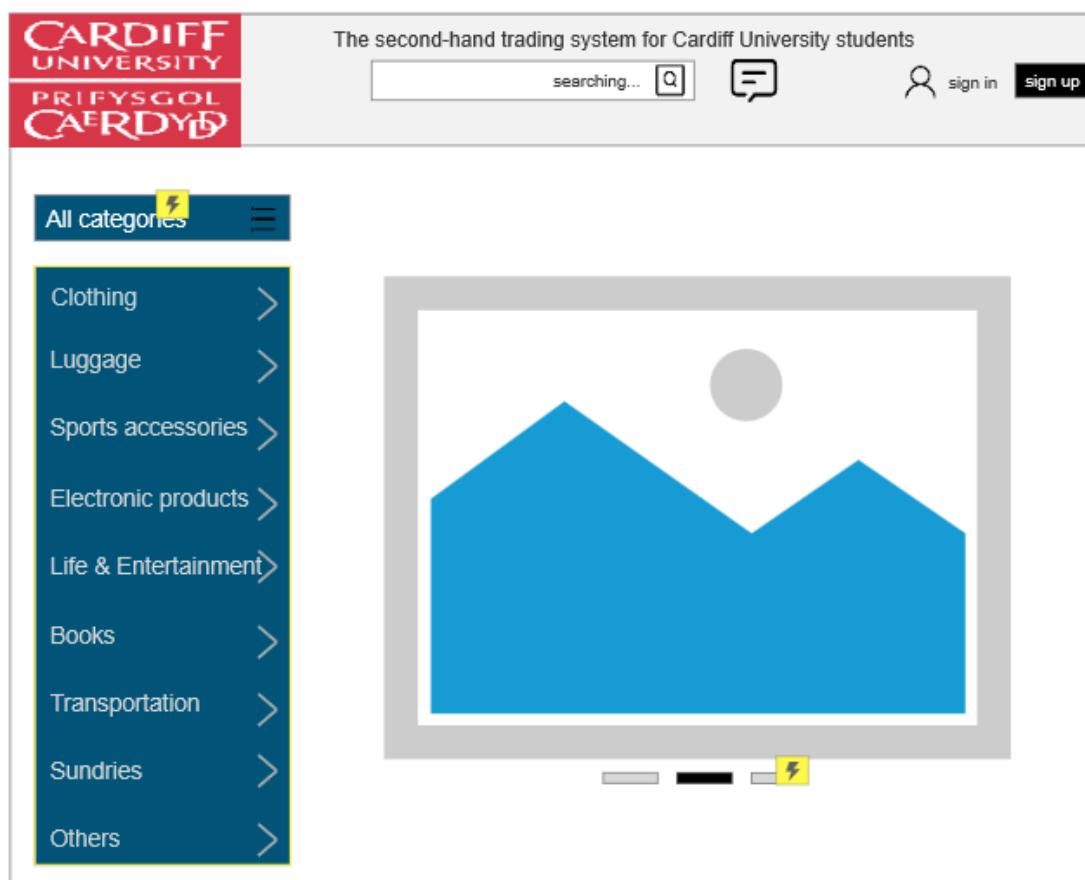
The structure of the system is mainly influenced by the technology chosen, the functional requirements and the design of the pages. In this project the system is designed according to a structured, modular system design approach. The structured design is based on modularity. We have divided the second-hand trading platform into a front-end system and a back-end management system according to practical needs. The functions of the front-end system mainly include user viewing of different product information, user setting and modification of personal information, user setting and modification of product information, general shopping permissions owned by the user, etc. It also includes some management operations for the administrator, such as the back-end management interface, the interface for deleting users and product information, etc. The main functions of the back-end system include storage of user data, uploading and downloading of products and personal information from the database, simulated chat, search functions, etc.

In this system, users are divided into two categories of permissions, one for

administrator accounts and one for user accounts. Administrator accounts are restricted to the developers and operators of the system. The user account must be registered and must use the Cardiff email address. These two types of user have different rights and can use different functions. The user account can perform all the functions of a user as mentioned in sec 3.2, including modifying personal information, posting products, buying products, chatting with other users, viewing posted products, etc. The administrator account can perform operations such as reviewing products, deleting products, removing permissions from the user's account, etc. Actions that can be performed by both types of users include searching for products and browsing for products.

4.2.2 Prototypes and interactions

1. The homepage

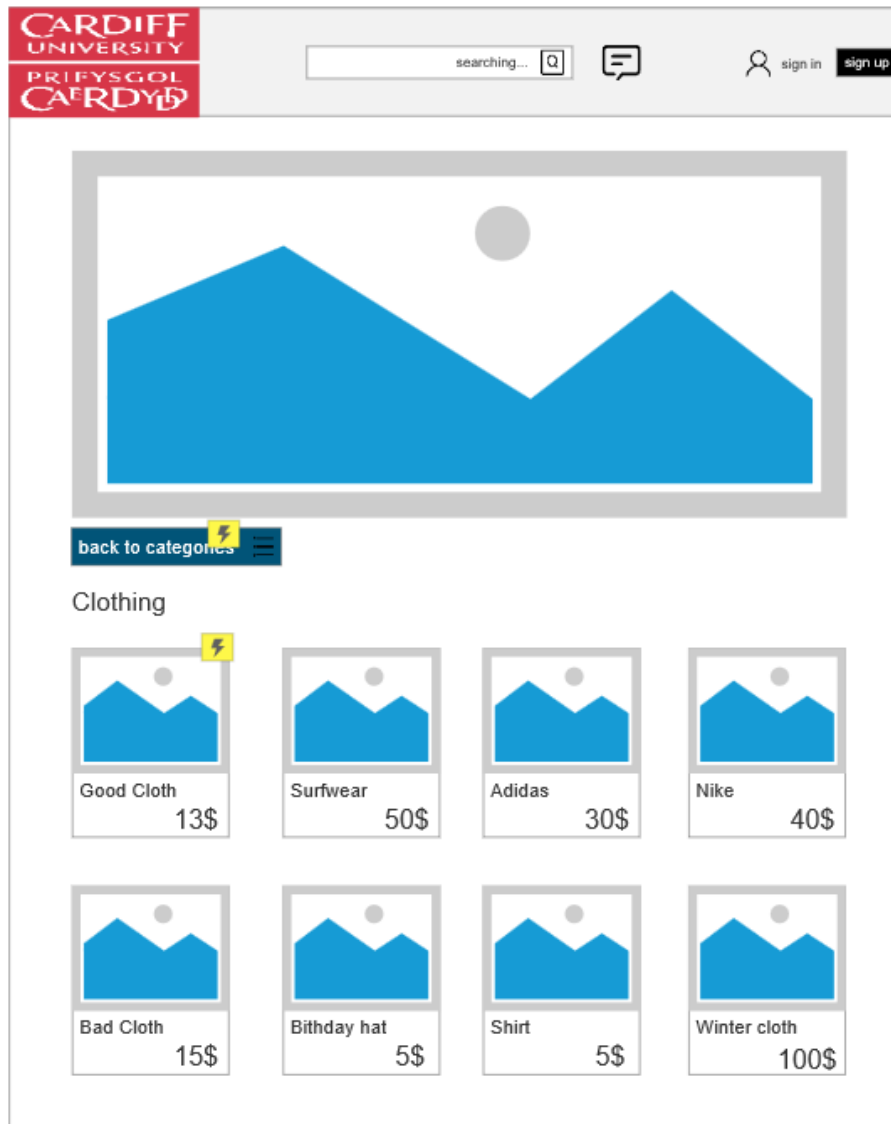


The header of the homepage consists of the following elements: firstly, the logo of

Cardiff University, which is located in the top left corner and is displayed most prominently to highlight the fact that this is a project for the campus as a target group. This is followed by a text description of the project. In addition to this, there is a search box for searching for product items and a login screen for users to log in to their accounts. The main content of the homepage shows all the product categories available in the project. Each product category should be a link. Clicking on any of the links will take you to the page corresponding to that category, which will be described later in this section. At the same time, the homepage will show some images, which will consist of the latest releases, all of which will appear on the homepage, either as images or as text.

Designability on the product homepage is something worth exploring. Although the developers of this product were keen to make the homepage more aesthetically pleasing, a certain degree of aesthetics was sacrificed in the design of the prototype to ensure that the user is clearly informed of all catalogue information and current products.

2. A category of product page (take clothing as an example)



Clicking on the product type link on the left-hand side of the home page will take you to this screen. In this page, the structure of the header is the same as the home page. The main part of the page is used to display all the products under the category. Multiple products form a single row, and each page can display multiple rows. All the products displayed belong to the selected category. The information displayed for each product includes: the image, the name, and the price set by the user. Each image is a link that takes you to the item's details page when you click on it. The product details page will be explained later.

In specific category pages, the designer needs to consider the following questions: one, what does the user want? Secondly, which content is displayed to meet the user's needs.

The answer to the first question is obvious: to display a sufficient number of items on the same page without dazzling the eye. Therefore, four per row, with reasonable spacing to fill the whole page, is undoubtedly an appropriate means. The second issue needs to be considered alongside the issue of aesthetics. Displaying a large amount of information such as prices, sellers, product descriptions etc. certainly help the user to get information quickly, but it can make the page feel cluttered. Therefore, the product ended up with a compromise of displaying some of the key information.

3. Product details page

CARDIFF
UNIVERSITY

PRIFYSGOL
CAERDYDD


The second-hand trading system for Cardiff University students



searching...

avatar

name

log out



Good Cloth

Price **13\$**

Category Cloth

State In sales

Seller name

Location somewhere

Buy now

Contact the seller

Description

Something said by the seller

Comment

User1

Really GOOD!

Leave a comment

Clicking on an item will take you to the product details page. In addition to the information, it can be seen on the category page, the product details page also contains the following additional information: the name of the seller, the description information set by the seller for the product, and the comments left by other users for the product. The description information is set by the merchant and is completed when the item is posted. Comments can be posted by all users and other users can see the comments made by other users on the product page.

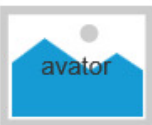
In addition, users can choose to add the product to their shopping cart or purchase it directly from the product details page. If the user adds the product to the shopping cart,

the user can choose to complete the purchase of the product in the shopping cart. If the user chooses to purchase the item directly, the page will redirect to the payment page.

The design of product pages needs to focus on just one issue: comprehensiveness. Users are eager to know everything they need to know on a product page. Basic information about the product, about what other users have suggested about this product, but also what the seller himself thinks about the product. Therefore, presenting as much of this as possible on an aesthetically pleasing basis is the first priority for this page.

4. "my" page

The screenshot shows a web interface for a second-hand trading system at Cardiff University. The header includes the university's name in English and Welsh, a search bar, and user navigation links. The main content area is titled 'The second-hand trading system for Cardiff University students' and contains a user profile section. The profile section has a sidebar with links for 'about me', 'selling', and 'purchased'. The main profile area displays a user's avatar, nickname, and statistics. Below this, there is a form for updating personal information, including fields for telephone number, email, location, and a comment, followed by a 'reset' button.

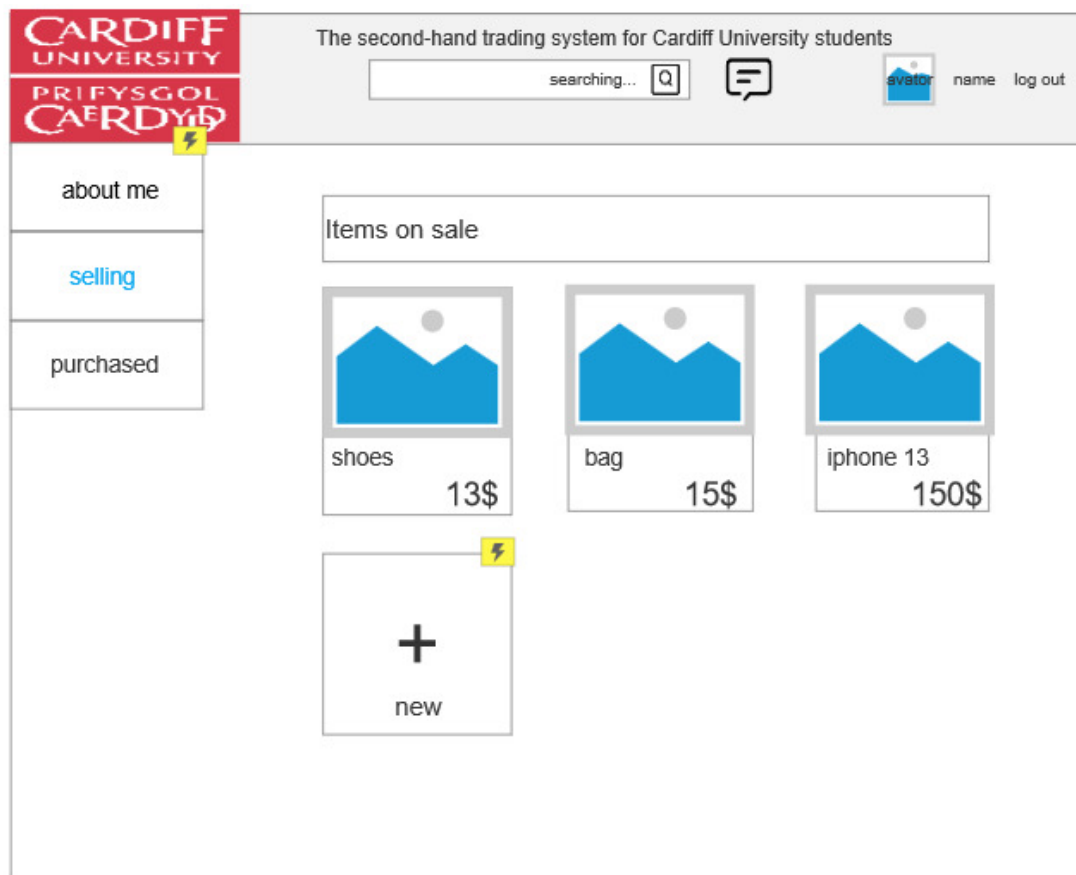
Avatar	Age	In Sales	My comment
 Tim	1	3	2

Tel:	+86xxxxxxxxxxx
E-mail	xxxxxxx@cardiff.ac.uk
From	China
Say something	Wish everyone can have fun and buy things you want here

[reset](#)

After logging in, users can click on the "My" icon on the page to access the "My" page, where they can view the personal information they have registered at the time of registration. Personal information, including gender, nickname, avatar, email address, phone number, etc. You can change your personal information by clicking on "reset" on

the personal information page. If you wish to cancel your changes, you can do so by clicking on "cancel".



In addition to personal information, the 'My' page also includes 'selling', which can be accessed by clicking on 'selling' on the left-hand side of the screen. The page contains a list of the items you have sold and the items you are currently selling, which are also displayed in an abbreviated form. However, the item will not be accessible by clicking on the new link.

5. Product Listing Page

On the "selling" page, click on new to enter the new product listing page. Products posted on this page will be displayed in the user's 'selling' list and will also appear on the product pages that other users can view. On this page, you will need to fill in the necessary information for your product, including the product name, price, description,

and image. All of these fields need to be filled in, otherwise the item will not be posted. Other users will be able to view the information set by the seller on the product thumbnail page and the product details page respectively.

The screenshot displays a web application interface for Cardiff University. The header features the university's logo in Welsh and English, a search bar with the text 'searching...', a chat icon, a user profile icon labeled 'avatar', and links for 'name' and 'log out'. A sidebar on the left contains three menu items: 'about me', 'selling' (highlighted in blue), and 'purchased'. The main content area is titled 'Creating a new sale' and contains several form fields: 'Trade name' with a subtext 'A good name will help your products to be found more easily by those who need them'; 'Price' with a subtext 'Make sure you choose the right price'; 'Description' with a subtext 'Explain why you are selling and the quality of the item'; 'Picture' with a subtext 'Good pictures are half the battle for a successful sale' and a large plus sign icon; and 'Trading locations' with a subtext 'Determine where you are as an initial trading position'. At the bottom of the form are two buttons: a blue 'submit' button and a grey 'cancel' button.

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

searching... [search icon] [chat icon] [avatar icon] name log out

about me

selling

purchased

Creating a new sale

Trade name
A good name will help your products to be found more easily by those who need them

Price
Make sure you choose the right price

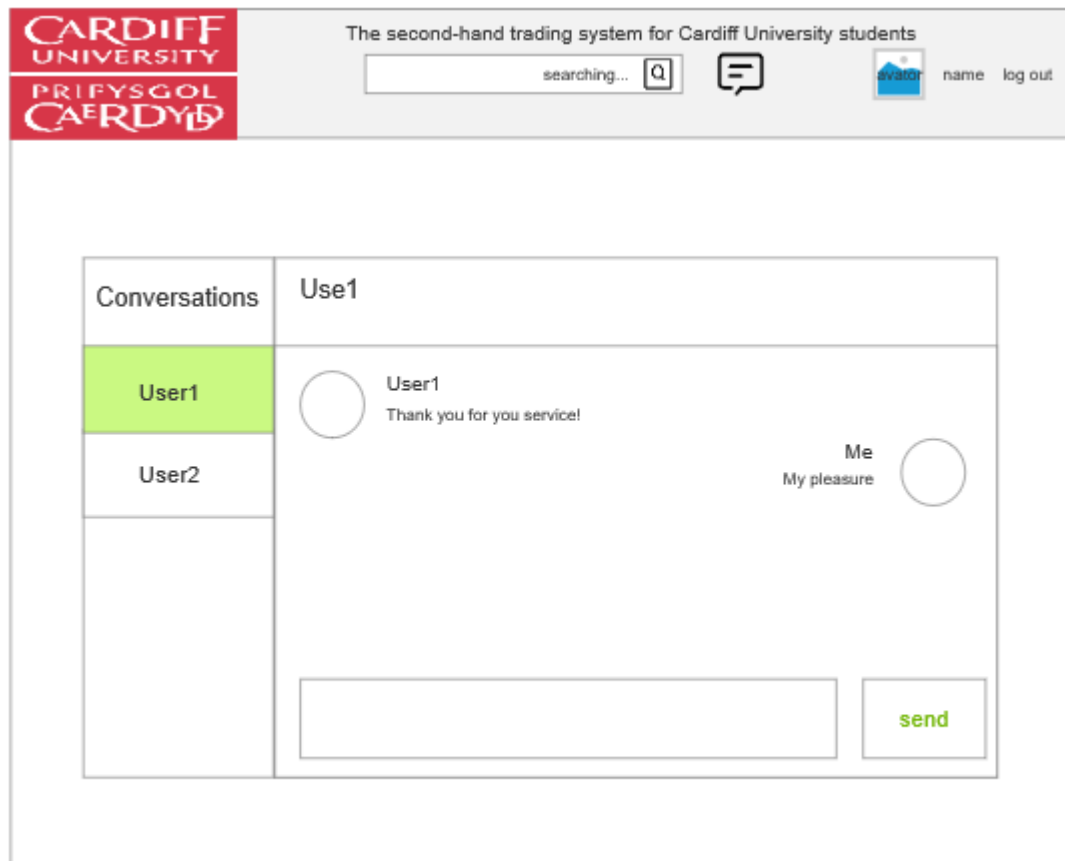
Description
Explain why you are selling and the quality of the item

Picture
Good pictures are half the battle for a successful sale

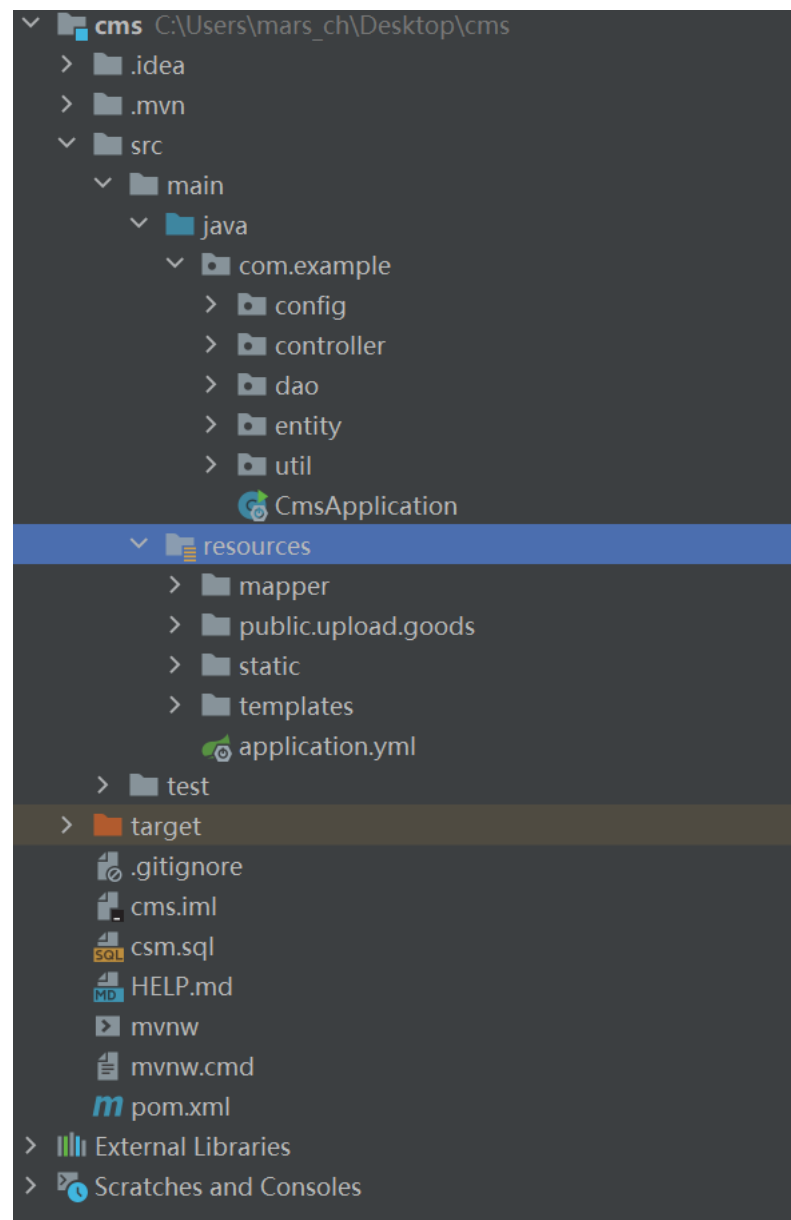
Trading locations
Determine where you are as an initial trading position

submit cancel

Buyers can contact the seller by clicking on chat in the product screen. The chat function is similar to common live chat software, where user A sends a message and user B will receive a message from user B in the chat page. User B can reply to user A's message at any time and the message will be saved on the user's chat page.



4.3 Design patterns and code frameworks



The code framework used for this project uses a separation of front and back ends, as well as standard code frameworks such as entity-controller. The diagram shows the complete structure of the project code, which is described in full as follows.

The .mvn folder contains all the maven dependencies used in the project. Its function is to undertake all the build processes that need to be performed for this project.

The Src folder contains all the files that are used to complete the code for the back-end tasks and it includes

The .config folder. This contains all the configuration files that are set up in the project. These configuration files are used to perform data read/write and store related configurations. Configuration information, including template tools such as thymeleaf used in this project, is stored in this folder.

Controller folder. This contains the core of the project's back-end files, which are used to perform all data control and logic running on the pages. The project has a controller file for each page that involves data transfer and logical judgement.

The Dao folder is used to store the data access interface, and when data needs to be passed, the interface in the dao folder needs to be called.

Entity folder. Every object that involves a specific instance, such as user, administrator, etc., is stored in the entity folder. This is another core part of the backend file, all operations on objects are essentially operations on the data types stored in the entity folder.

The Mybatis folder. This contains the mappers that are associated with the database and are used to establish connections to the database.

The Resource folder contains the code and resource files related to the front-end interface, which include

Upload folder. All image files are stored in this folder and the source files for all images that the user sees in the second-hand trading platform need to be stored in this folder. When a user makes an upload of a new image, the file will also be stored here.

The Static folder contains the CSS and img files that are used to set the static layout of the interface. The location, size and other values of all page elements are determined by the code in this folder. In this project, each page is configured with a separate css file to ensure robustness of the code.

Templates folder. This contains the html files for each page, which form the basis of the page's interface.

The introduction in this section is mainly for an overview of the frameworks, more

detailed introduction and examples will be shown in 5.2

Chapter Five: Products Implementation

5.1 User manual

This section will teach the user how to deploy the project.

1) Apache Maven-3.8.6

First, you need to download a correct version of maven. You can get the 3.8.6 maven from the apache website.

2) Deploy the project on your development software.

You can use IDEA to import the pom.xml file and wait for IDEA to automatically download the relevant jar packages from the Maven repository.

3) Connect to your database.

The database settings are located in the project's src/main/resources/application.yml.

```
datasource:
  driver-class-name: com.mysql.cj.jdbc.Driver
  url: jdbc:mysql://localhost:3306/csm?characterEncoding=UTF-8
  username: root
  password: 111111
```

Please change your database connection address, name and password here.

4) Run it in web browser

Also, in the application.yml file, you can change the server port. For example, in this project, we use 9999 as the port number.

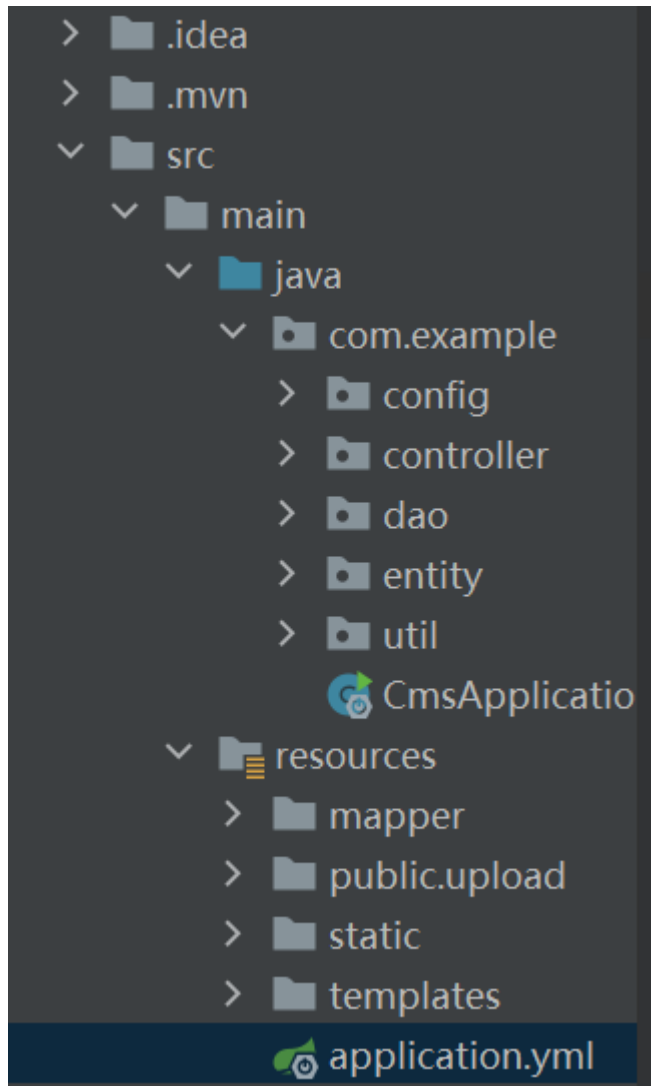
```
server:
  port: 9999
servlet:
  context-path: /cms
```

If you want to run the project, first you need to start it in idea, then type localhost:9999/cms/index into your browser.

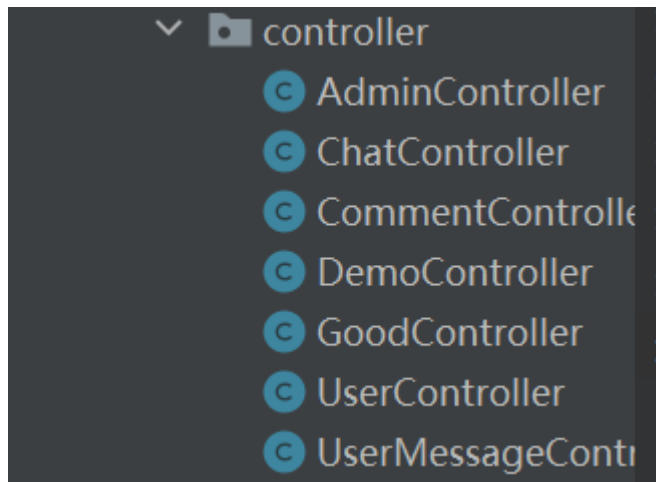
5.2 Implementation and screen shot

a) Project Structure

This is the overall structure of the project, the part done by the author is mainly java and resources. We will cover each of these in the following sections.



b) Controller



The Controller is the business control layer, responsible for receiving data and requests and implementing the corresponding functions.

```
@RequestMapping("/index")
public ModelAndView latest(){

    log.debug("Find the newest five goods.");
    ModelAndView mv = new ModelAndView();
    List<Good> goodList = goodDao.getListByTime();
    mv.addObject(goodList);

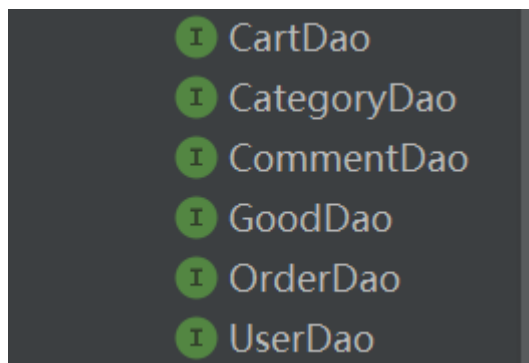
    //0 is not login.
    User user = new User();
    int id = Function.getUserId(request);
    if(id == 0){
        user.setId(0);
    }
    else{
        user = userDao.getById(id);
    }
    mv.addObject(user);

    mv.setViewName("/index");
    return mv;
}
```

This is an example of a controller that accepts a request for an index page, where we make a determination that the user is logged in to display the appropriate information

and design the page to display the latest five items.

c) Dao

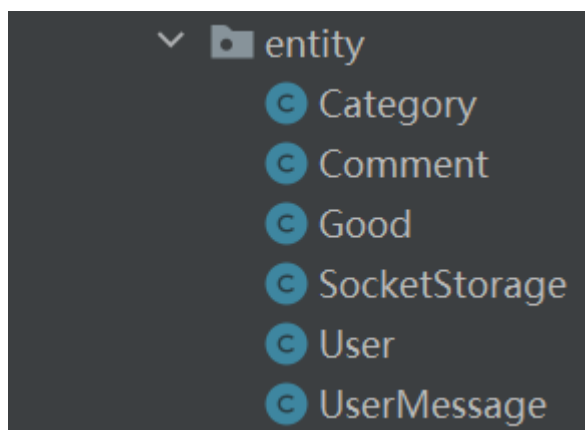


The Dao layer will first create the Dao interface, then you can define the implementation class of the interface in the configuration file; then you can call the Dao interface in the module for data business processing, without paying attention to the specific implementation class of this interface is which class, the parameters of the data source and database connection of the Dao layer are configured in the configuration file. This is an example of Dao:

```
public interface CategoryDao {  
    //find the category message  
    List<Category> getList();  
}
```

We define an interface named getList in order to find all categories.

d) Entity



It is mainly used to define the properties of the database object, providing get/set

methods, to string methods, reference and non-reference constructors.

```
@Getter
@Setter
@ToString
public class Category {
    //category id

    private int id;

    private String name;
}
```

Again, we use the category entity as an example. Here the number of the category is defined, as well as the name. Methods such as constructor are implemented using the @Getter, @Setter and @ToString in lombok.

e) Util

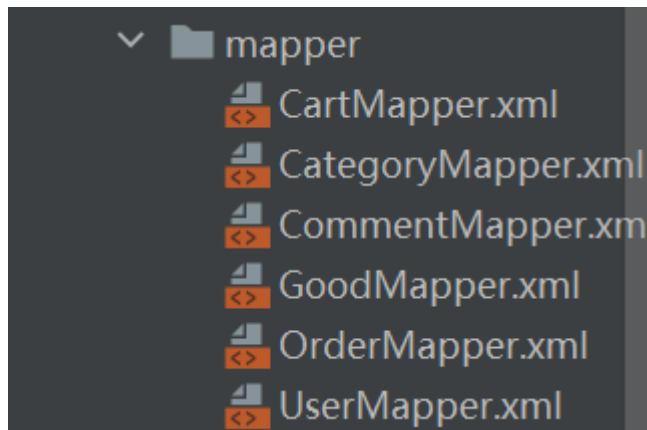
```
FileUpload
Function
```

Util stands for tool and is often used, in general, to describe data processing that has no relationship to business logic. In our project two utils are applied, the first one is responsible for accepting files from the front end and saving them to a set location and the second one returns the ID of the currently logged in user.

f) CmsApplication.

This is the entry class for SpringBoot and the SpringBoot project can be started via the main method of this class.

g) Mapper

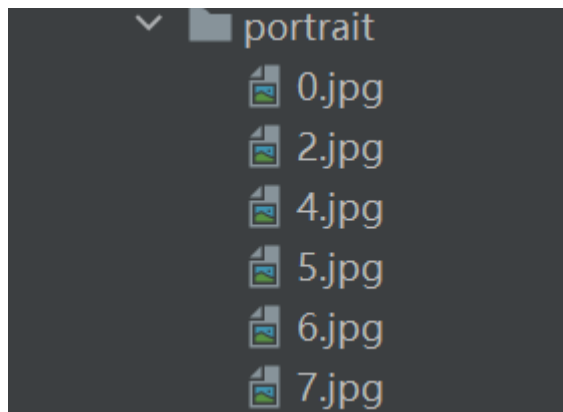


The mapper is used to implement the methods designed in the Dao layer, and it is used to add, change, check and delete operations on the database through SQL statements.

This is the CategoryMapper.xml:

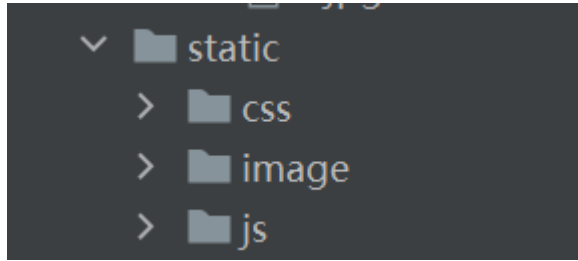
```
<?xml version="1.0" encoding="utf-8" ?>
<!DOCTYPE mapper PUBLIC "-//mybatis.org//DTD Mapper 3.0//EN" "http://mybatis.org/dtd/mybatis-3-mapper.dtd" >
<mapper namespace="com.example.dao.CategoryDao">
  <select id="getList" resultType="com.example.entity.Category">
    select * from category;
  </select>
</mapper>
```

h) public/upload



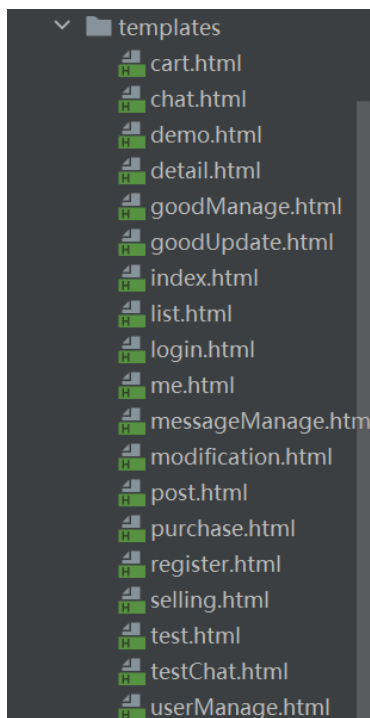
```
<?xml version="1.0" encoding="utf-8" ?>
<!DOCTYPE mapper PUBLIC "-//mybatis.org//DTD Mapper 3.0//EN" "http://mybatis.org/dtd/mybatis-3-mapper.dtd" >
<mapper namespace="com.example.dao.CategoryDao">
  <select id="getList" resultType="com.example.entity.Category">
    select * from category;
  </select>
</mapper>
```

i) static



By default springboot puts static pages in static and dynamic pages in templates. So in static we store CSS, js and the images used.

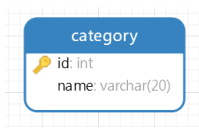
j) Templates



Templates holds dynamic pages that use the thymeleaf template engine.

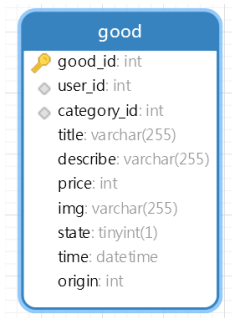
Likewise, database design is an important part of any development project. The field selection and relationship selection of the database will largely determine the convenience of data storage and reading and writing in the process of user products. According to the needs of the student second-hand market, this project designs the data items and data structures as shown below:

- a) Categories entity : id, name



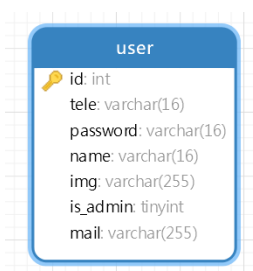
Id represents for the category number, and name is the classification name.

- b) Goods entity : good_id, user_id, category_id, title, describe, price, img, state, time, origin



Good_id is the identification of one good. User_id shows which user it belongs to. Category_id represents the classification of the good. Title, describe, price and image are the basic introduction of the good. State shows whether the good is being sold or has been sold. Time records the post time of the good. The last attribution origin contains the origin price of the good.

- c) Users entity : id, tele, password, name, img, is_admin, mail

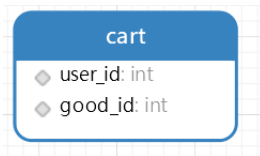


Tele, password, name, img and mail are the basic information of one user. Is_admin shows whether the user is an administrator.

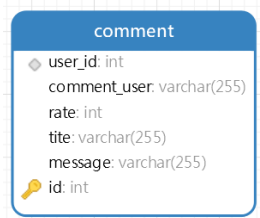
- d) Orders entity : user_id, good_id, order_id



- e) Carts entity : user_id, good_id



f) Comments entity : user_id, comment_user, rate, title, message, id

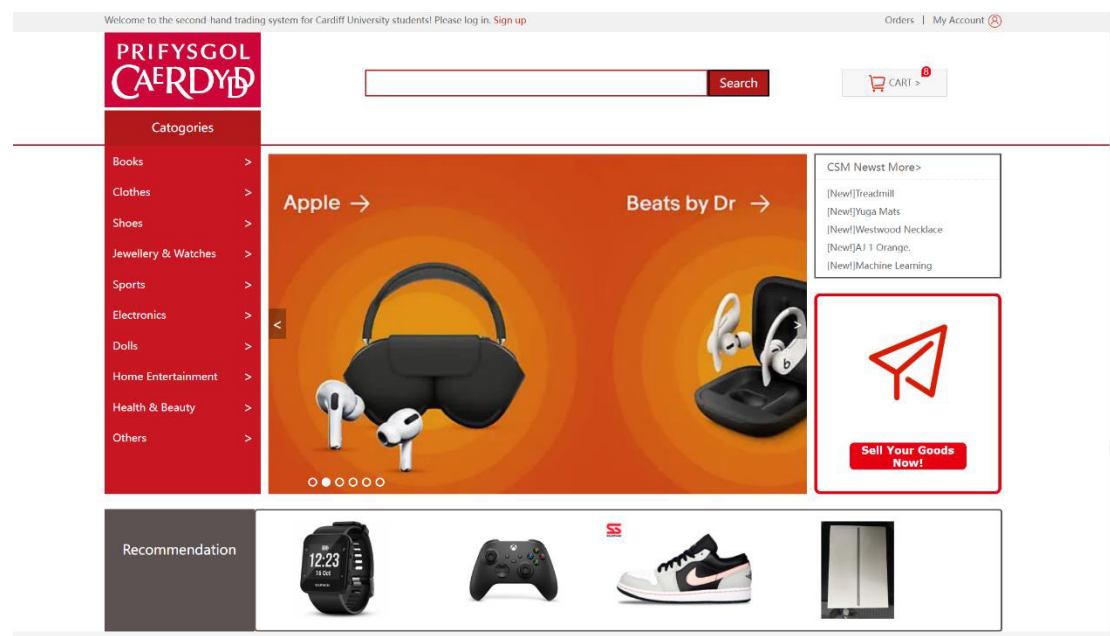


Rate is the comment user's satisfactory level to the seller.

5.3 Interface and function

This section describes the final user interface rendered for this project, and the logic that runs when interactions occur. This description will be explained page by page.

1.Main page



Similar to the one shown in the prototype, the page consists of a header and the rest of the page. The available buttons in the header are login (if the user does not have an account, they can choose to create one after entering the login page), go to the "order"

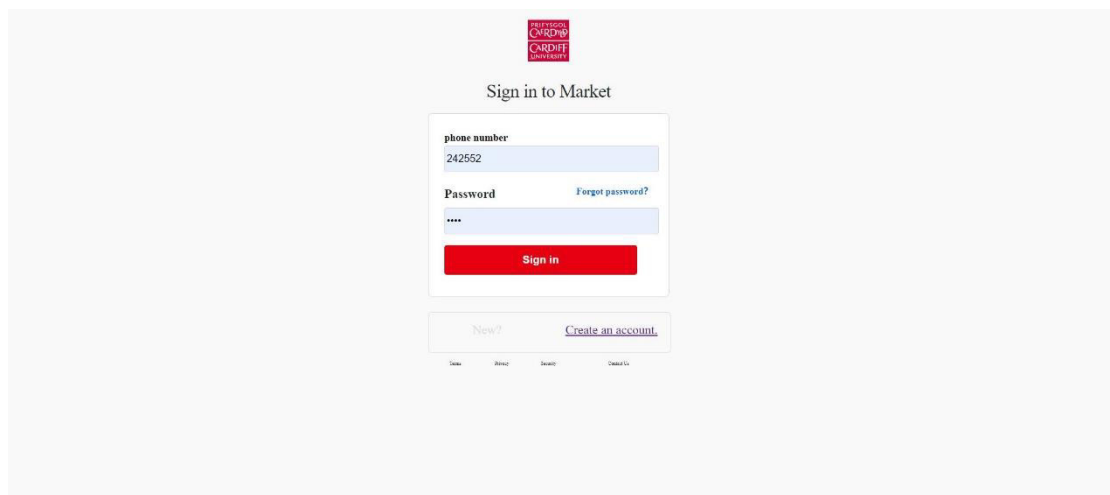
page and go to the "my account" page (the "my" page mentioned in the prototype). The user interface and the functions of the above pages will be the same as the "my" page.) The user interface and functionality of these pages will be described in subsequent sections.

The remaining sections include the category menu on the left, the product recommendations below and the display space in the middle. Each category in the left-hand menu corresponds to a specific page, and clicking on a link will take you to a list of all products of that type. The red "sell your goods now!" button on the right-hand side allows the user to quickly jump to the product listing page. The product listing pages will be described in more detail later.

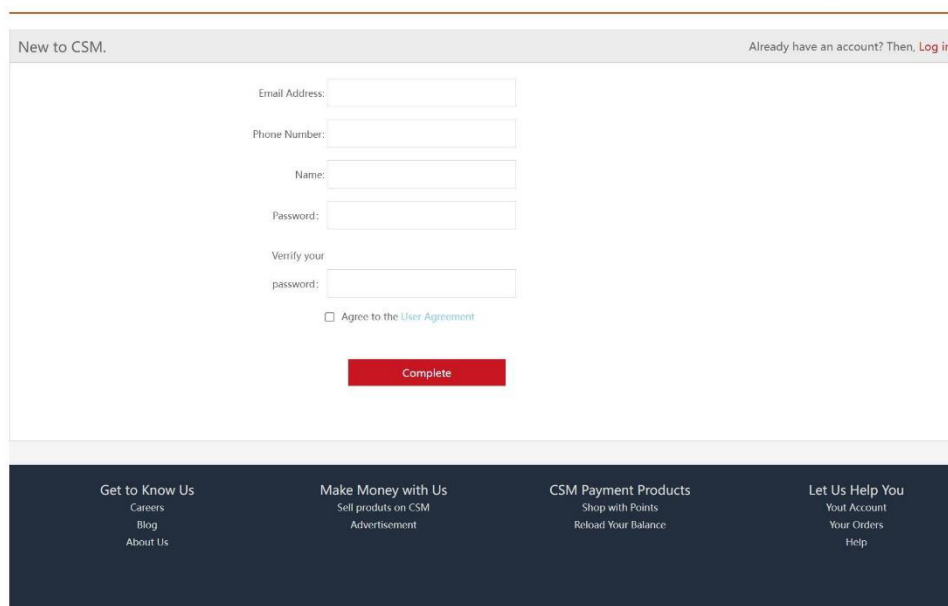
Apart from the pages described above, the rest of the page is devoted to "product recommendations", with the CSM newest column showing the latest products posted by the user. Once posted, these items are stored in the database and displayed in descending chronological order (i.e. the newer they are posted, the higher they are listed) under this section. The banner in the middle has the same logic as the CSM newest, but only shows images. The bottom recommendation section displays a random number of items, selected at random from the database.

It is worth noting that the main colour of the home page is red and white. This choice was made on the basis of "page aesthetics". According to a survey published by the "China Entropy Data" agency, more than two main colours on a page will lead to a loss of aesthetics and make the page less coherent. As the logo of Cardiff University is made up of red and white, the rest of the page should also be in these two colours. The rest of the page follows this principle and will not be subject to additional explanation.

2. Sign in and sign up



The image shows a 'Sign in to Market' form. At the top is the 'PERFECT CARDIFF' logo. Below it is the title 'Sign in to Market'. The form has two input fields: 'phone number' with the value '242552' and 'Password' with masked characters '****'. There is a 'Forgot password?' link next to the password field. A red 'Sign in' button is below the inputs. At the bottom, there is a 'New?' link and a 'Create an account.' link. Small text at the very bottom reads '© 2015 Perfected Cardiff Limited'.



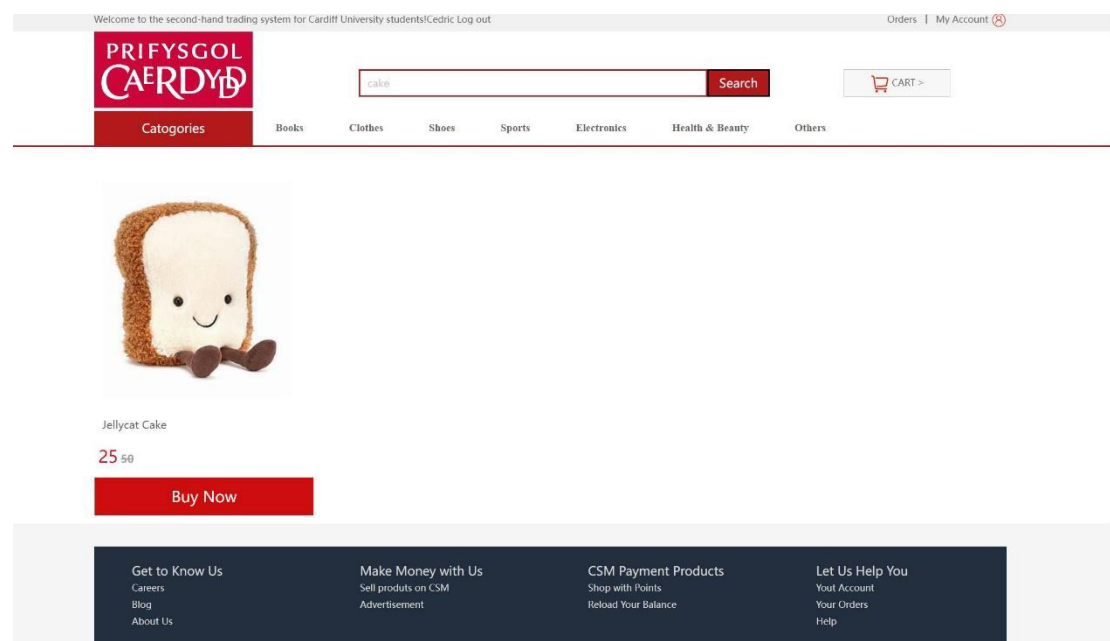
The image shows a 'New to CSM' form. At the top left is the text 'New to CSM.' and at the top right is 'Already have an account? Then, [Log in.](#)'. The form has five input fields: 'Email Address:', 'Phone Number:', 'Name:', 'Password:', and 'Verify your password:'. Below the 'Verify your password:' field is a checkbox labeled 'Agree to the [User Agreement](#)'. A red 'Complete' button is at the bottom. The footer contains four columns of links: 'Get to Know Us' (Careers, Blog, About Us), 'Make Money with Us' (Sell products on CSM, Advertisement), 'CSM Payment Products' (Shop with Points, Reload Your Balance), and 'Let Us Help You' (Your Account, Your Orders, Help).

There are various ways of accessing the sign in and sign-up pages, but the same principle applies: when a user performs an action that requires a change to the database information of a user entity, the user's login status is checked. If the user is not logged in, they will be redirected to the login page. These actions include: clicking on "sell your good now" on the home page, clicking on "buy now" in the product thumbnails, clicking on "add to chat" or "buy now" on the product details page. "or "buy now" on the product details page. Alternatively, you can access this screen directly by clicking on the sign in button on the home page.

The sign in page includes a basic guide to filling in the information. As this project is aimed at students of Cardiff University, all user accounts are for Cardiff University email addresses and passwords are not restricted. Once you have filled in your account and password, click sign in to log in. If the password does not match an existing password group in the database (i.e. no account, wrong password), then the user can log in. If the password does not match the password set in the database (including: no account, wrong password), the page will return a login failure message.

If you do not have an account with the project, you will need to register by clicking on create an account. As mentioned above, this project only supports registration using the Cardiff University email address. Once the user has entered their email address, they will receive a verification code to verify their identity. Once the code has been entered correctly, the user will be registered successfully. The password set for the successful registration will be saved in the database and the user will be able to log in next time by entering the correct password for the account.

3. Specific category page

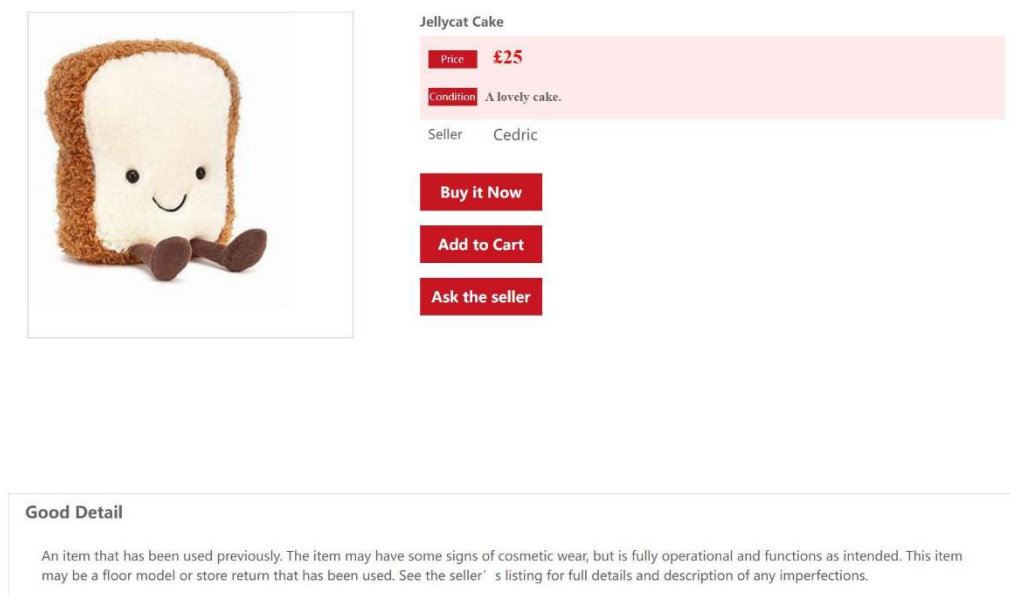


As described in the introduction to the homepage, each item in the menu on the left-

hand side of the homepage corresponds to a page of one of the product categories. Clicking on a category will take you to a page containing all the products under that category. This classification is based on the "categories" in the database, e.g. products of type "book" will appear in the book page. This field is set by the user at the time of posting the product and the project will provide the user with all categories as options when posting the product. This field cannot be empty, as it is the only basis for the category.

The user can browse the products themselves on this page. The buttons available include other categories, going back to the home page (categories in the top left) and clicking on the product image to go to the product's detail page.

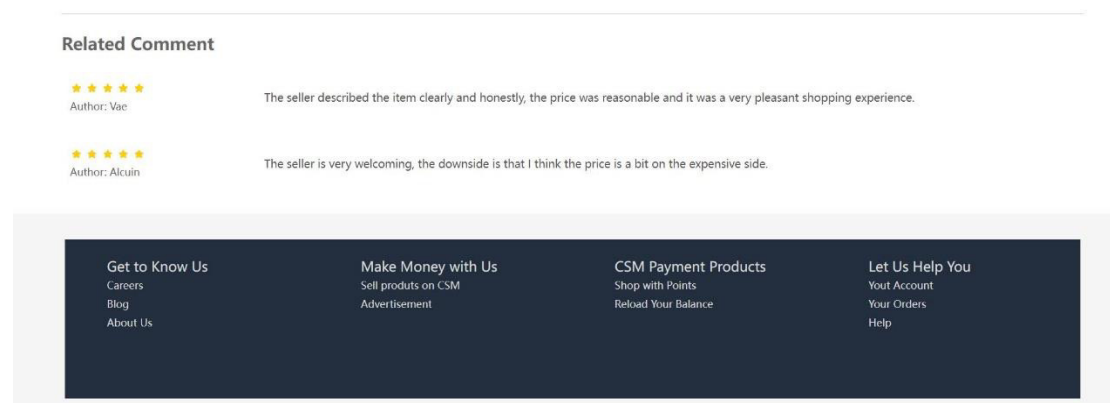
4. Specific product page



Each product will have a separate product page. The product page displays all the information about the product, including: product name, product price, product description, and product publisher. All the fields on the product page are filled in by the user at the time of posting. These fields are stored in the database with the product as the primary key and cannot be modified after they have been posted. If you wish to adjust these fields, the product publisher will need to republish them.

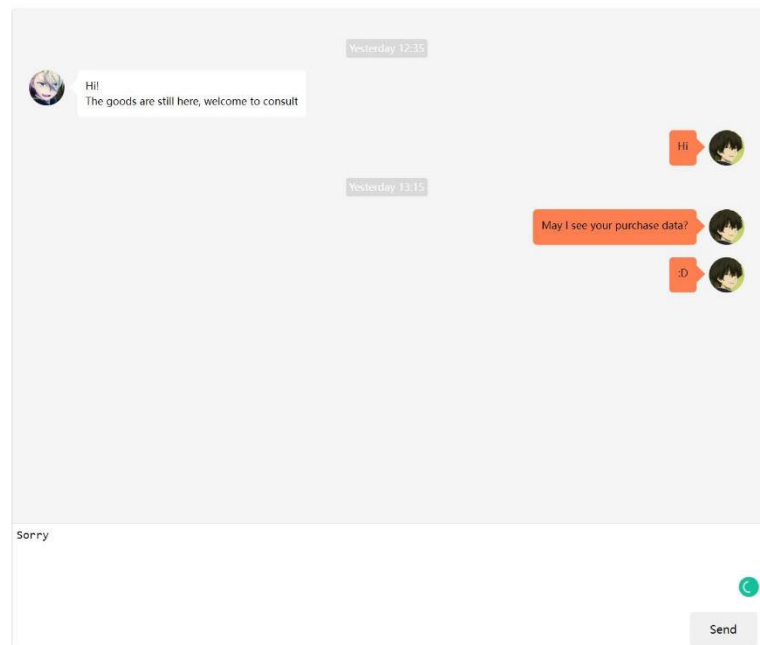
On the product page, users can still jump to other product category pages or return to the home page. Also, the three red buttons are all available on this page. These include buy, add to cart, and ask seller. Clicking on the buy button will take you directly to the payment/order page. Clicking Add to Cart will add the item to the shopping cart and take the user to their own shopping cart page to browse. Clicking on Ask Seller will bring up a chat page with the seller. These function will be described in more detail later.

5.Comment



At the bottom of each product page there is a comments section where all users will be able to post comments on the current product and view comments made by other users on the product. When an item is removed from the shelves or purchased, all comments will also be cleared. At the moment, as the project is only locally supported, the comments are only for display purposes and are added and removed by the developer. When it becomes operational, the comments feature will be available for users to add, delete and view on-the-fly.





6.Chatting



Buyers can click on "ask the seller" on the product details page to set up a chat with the product seller. On the chat page, similar to other online chat software, users can leave messages, send and receive messages and other functions. During the development of this feature, the developers faced some challenges. As this project is run locally, it was difficult to follow the normal process of implementing online communication, i.e. establishing a tcp connection. As a tcp directed connection could not be implemented locally, when user a tried to send a message to user b, user b would not receive the message. In this case, the developers considered other options, i.e., using a database to store chat content so that when user A sends a message to user B, user B will be able to read the chat message in the database after the next login. However, this solution would lead to serious privacy issues, i.e. the user's chat data is stored locally by the developer, which does not meet the product security requirements. Therefore, the project ended up using a compromise by simulating the chat function as a local link, but the user would not actually be able to receive messages from other users. After the project has been

deployed to the cloud, the chat functionality will be iterated and real chat functionality will be implemented.

7.Cart

<input type="checkbox"/> Select all	Good	Price	Option
<input type="checkbox"/>	 AJ 1 Orange.	90	Delete
<input type="checkbox"/>	 Yoga Mats	5	Delete
<input type="checkbox"/>	 iPad Air 3.	450	Delete
<input type="checkbox"/>	 Jellycat Cake	25	Delete
<input type="checkbox"/> Select all	Delete selected goods		

Clicking on "Add to Cart" on the product details page will add the current product to the shopping cart and redirect you to the shopping cart page. Multiple products can be stored in the shopping cart page and orders can be deleted or generated from the shopping cart screen.

8.Order

Order ID: aaaaaaaaaa 60.000 £

 Method One

Purchase 60.00 £

 Method Two

Purchase 60.00 £

Confirm!

[Buy it later.](#)

Selecting buy it now on the product details page or generating an order on the shopping cart page will redirect you to the current order page. The functionality of this page is an

important topic for this project. The issue of payment security has been discussed as a topic in the previous sections. The existing second-hand marketplaces with websites or apps are all online (PayPal or visa), which offers convenience but also makes the user helpless in case of fraud. Typically, there are two main methods used by scammers using second-hand trading platforms: firstly, the seller uses a fake product to deceive the buyer and then disappears after the buyer has received the product. At this point, the transaction is complete and the second-hand trading platform will not be able to remedy this payment in any way. Secondly, the seller uses some means of fraud and completes collection, then does not send the goods and transfers the money already collected, leaving the buyer with no recourse to recover the money paid. Therefore, in a platform where security is a primary concern, it is important to think carefully about whether or not to use online payments as a method of transaction on the platform.

Due to the unique nature of the platform, all users are students or graduates of Cardiff University and are located in close proximity to each other. Therefore, it is possible to refer to the community-based online trading platform that is currently popular in China, where orders are generated online (to determine interest and negotiate prices) and payments are made offline. The order interface will only be used as evidence that the user has completed the negotiation of the transaction.

9. My page

Welcome to the second-hand trading system for Cardiff University studentsCedric Log out
Orders | My Account

PRIFYSGOL
CAERDYDD


Search

CART >

About Me

Sell Good

My Goods


Cedric

Age
18

In Sales
4

My Comments
2

Information

Name: Cedric

Phone: 123123

School: Cardiff

Reset

This information includes the user's name and avatar, their age, the number of products they are selling and the comments they have made, as well as their phone number and email address. All of the above information, except for the number of products on sale and the number of comments, can be modified by the user by clicking on the "reset" button in the "my page", which will directly modify the relevant fields in the database for that user. The number of reviews is determined by the number of reviews the user has made on the product. The value of this field will increase by 1 for each review the user makes and will decrease by 1 for each product that is deleted or removed from the database. The value of in sale is determined by the number of items posted by the user. The posting of items is described in more detail later

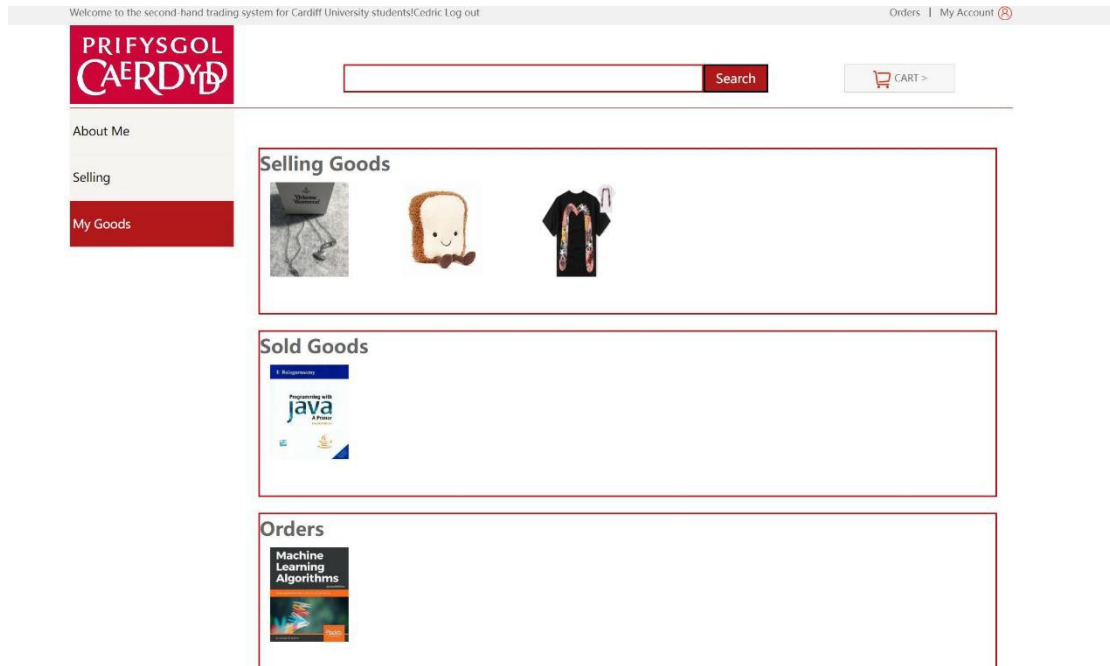
10.Selling

Selling	Trade Name A good name will help your products to be found more easily.	<input type="text"/>
My Goods	Category Find a suitable category.	<input type="text" value="book"/>
	Price A reasonable price is benefit for your selling.	<input type="text"/>
	Origin Price Tell buyers how much your good deserves.	<input type="text"/>
	Description Explain why you are selling and the quality of the item.	<input type="text"/>
	Picture Good pictures lead to a successful purchase.	<input type="button" value="Choose File"/> No file chosen

Users can post items by clicking on selling and going to the selling page. You will need to enter all the fields associated with the product during the selling process and these fields cannot be changed once entered. In addition to this, you will need to select a category and upload a picture of the product. Other users will be able to see the latest product recommendations on the homepage and see the corresponding product in the corresponding category.

After the user has posted the product, the number of in sales in my page will be increased by one and the posted product will be displayed in “selling good” of “my goods”.











11.My goods



In the my goods page, users can browse to their own "selling goods", "sold goods" and "orders". This separately counts the items that the user is currently selling, the items that have been sold, and the items that the buyer has placed an order for. Users cannot change these contents by themselves, and they need to complete the corresponding user behaviour on other pages to realize the modification.

12.Admin page

Welcome root !

No.	User ID	Category ID	Picture	Title	Description	Price	Option
4	4	4		Westwood Necklace	Cool necklace.	100	Delete
5	4	7		Jellycat Cake	A lovely cake.	25	Delete
6	2	2		Machine Learning	Contains concept of machine learning and examples.	8	Delete
7	4	3		Evisu T-shirt	Brand new.	16	Delete
8	6	5		Yoga Mats	A black mat. No use.	5	Delete
9	5	10		Blackpink Album	Pink Venom Album. Not unwrapped.	8	Delete
10	7	3		Canada Goose	Canada Goose down jacket in the wrong size, tried on only.	1000	Delete
11	7	6		iPad Air 3.	128GB.	450	Delete
12	6	9		Dior perfume.	Miss Dior 100ml.	120	Delete
13	7	5		Nike Basketball	A new basketball.	5	Delete

main








2022/09/07
Exit

User Management

Goods Management

Message Management

Welcome root !

No.	Name	Portrait	Phone	Option
2	Richard		432544	Delete
3	root		242552	Delete
4	Cedric		123123	Delete
5	Cherry		321445	Delete
6	Jane		645788	Delete
7	Yuanwei		342156	Delete
10	Yuki		222260	Delete

root@cardiff.com

The administrator's pages and functions are an important part of this project. Since the goal of this project is to build a safe and reliable campus second-hand trading platform, the administrator's review will play a pivotal role in it. Any users and products that violate the rules will be punished by the administrator. Therefore, the functions that administrators need to include: deleting violating products and deleting the accounts of violating users. At the same time, the administrator can access all user and product information on the page, which will help the administrator to process these items.

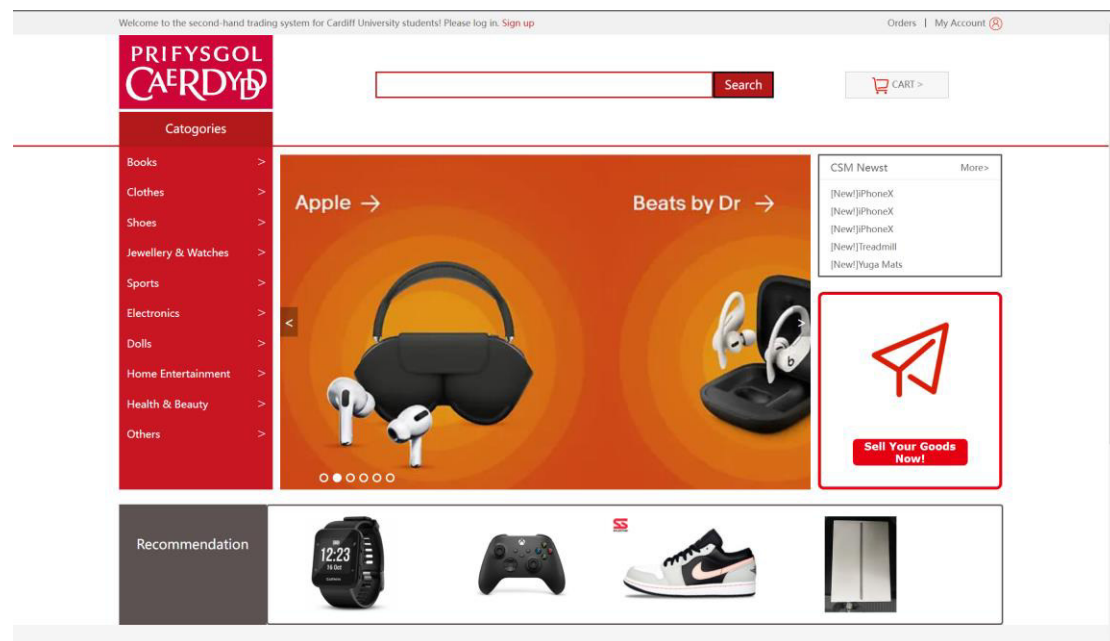
However, another question about administrators is also worth pondering: Does the existence of administrators affect the privacy and security of users? Based on the consideration of this issue, the administrator's page will only display the basic information used by the user for registration. In addition, the user's various data statistics, the user's chat information, etc. are not open to the administrator. Under the administrator function and other functions and non-functional designs, this project will ensure the information security, transaction security, and payment security of each user when using the product. At the same time, the above-mentioned simple and intuitive page also brings sufficient convenience to the user.

Chapter Six: Test

This section will show how the project works using screenshots and explanation.

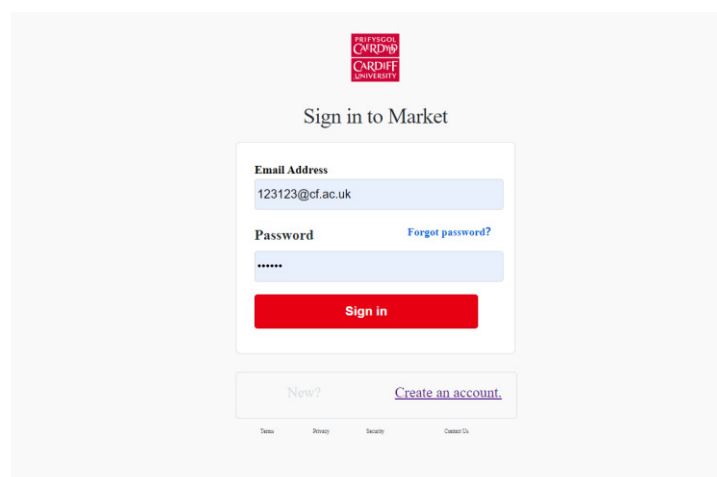
6.1 Welcome Page

When this program is run, it will first go to the home page which is also known as the welcome page. This page has the ability to log in and register, view the order cart, search by keyword, search by category, display the latest published products and recommended products.



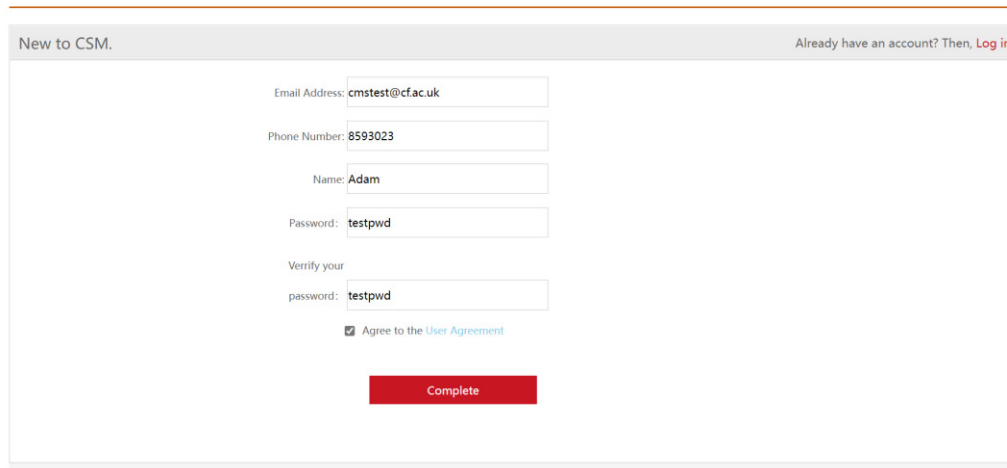
6.2 Log in

Clicking 'Please log in' at the top of any page will take you to the login page.



6.3 Sign Up

Click Create a new account on the login screen and click sign up on any screen to enter the registration screen.



New to CSM. Already have an account? Then, [Log in.](#)

Email Address:

Phone Number:

Name:

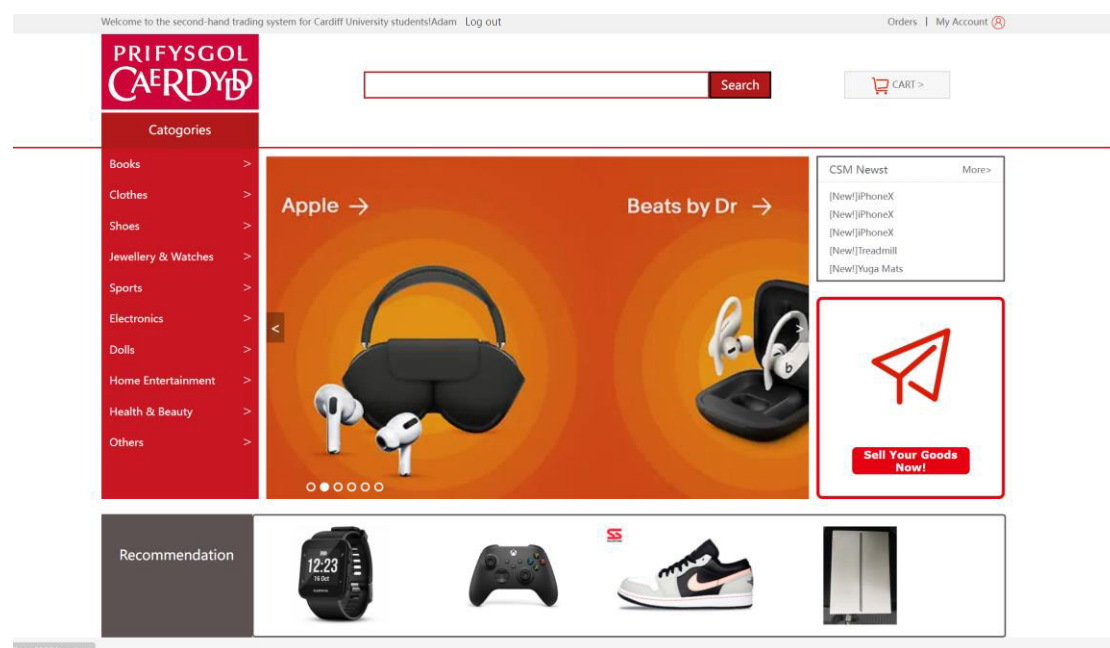
Password:

Verify your password:

☒ Agree to the [User Agreement](#)

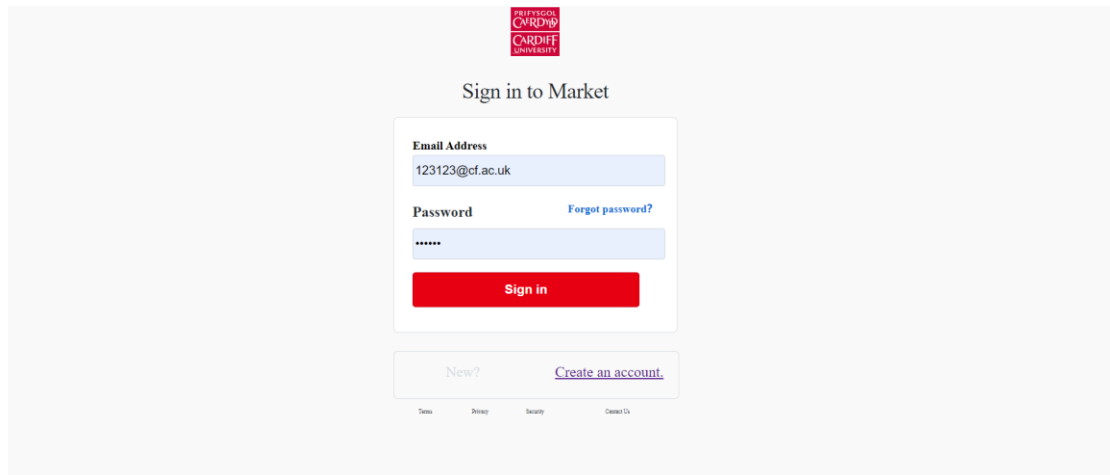
[Complete](#)

The test uses the example on the diagram to create a new account and log in, and you can see that the login was successful.



6.4 Logout

Similarly, when you click logout, the current user will be logged out and you can log in again. When press 'logout', the page jumps to:



**PRIFYSGOL
CAERDYDD
UNIVERSITY**

Sign in to Market

Email Address

Password [Forgot password?](#)

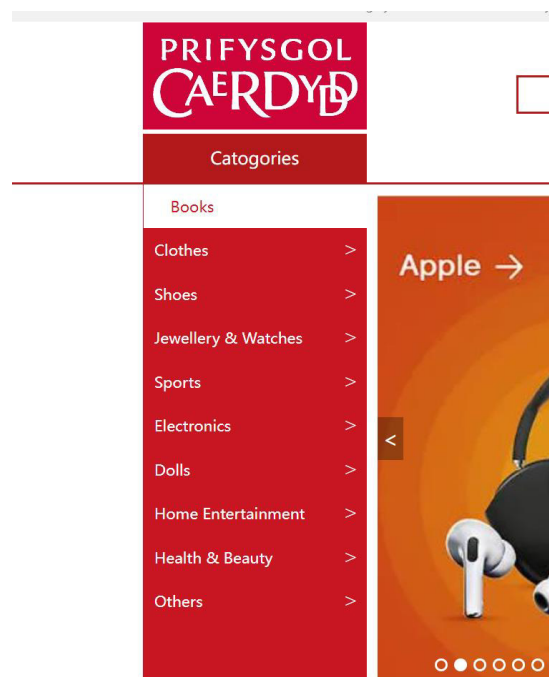
Sign in

[New?](#) [Create an account.](#)

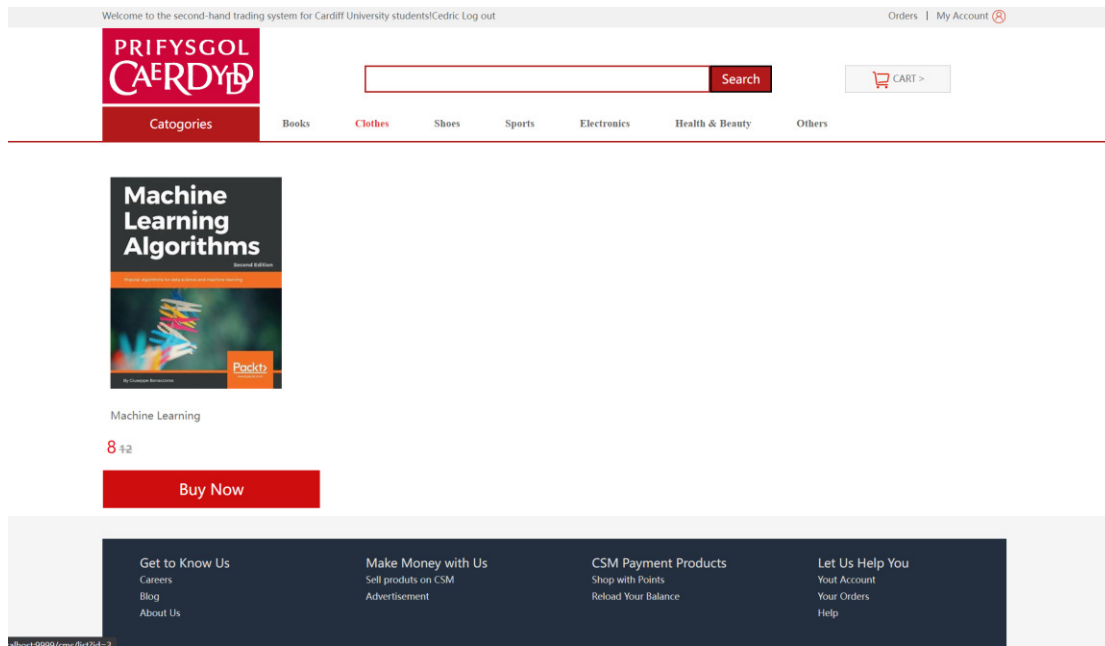
[Terms](#) [Privacy](#) [Security](#) [Contact Us](#)

6.5 Category Search

On the home page, when you place your mouse over a category label, the label you selected will turn white.

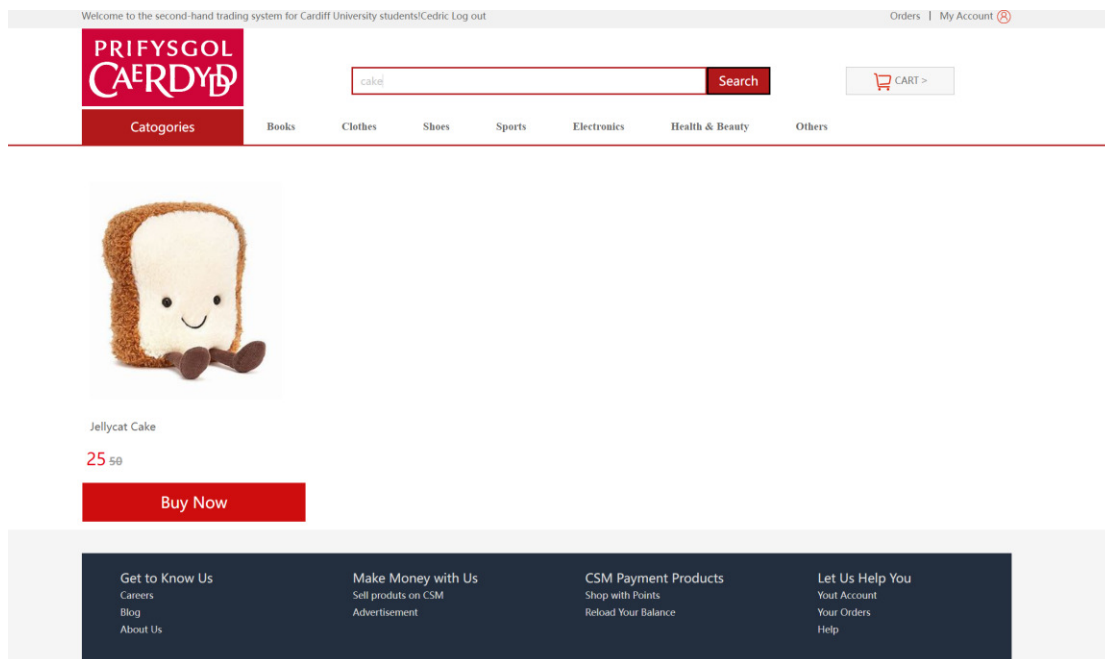


Click on the book, the consumers can see the category of books is selected. There will also be a category label on the top of the page, and when the mouse is placed over it, its font will turn red as shown in the image below.



6.6 Keyword Search

Typing a keyword into the search box above will also match the item.



6.7 Good Detail

This is the detail page of each good. On this page, the consumer can know the price and condition information of that good. Also, the consumer can choose to buy it or add it to cart. Or if the consumer has any question, he can ask questions to the seller. What's more, the website provides a comment function. Since this is a market for secondary

goods, one good may not have the past comment. We provide consumers with the comment to the seller.

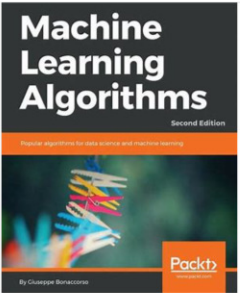
Welcome to the second-hand trading system for Cardiff University students/Cedric Log outOrders | My Account

PRIFYSGOL
CAERDYDD

Search

CART >

CategoriesBooksClothesShoesSportsElectronicsHealth & BeautyOthers



Machine Learning Algorithms

Second Edition

Popular algorithms for data science and machine learning

By Giuseppe Bonaccorsi

Packt

Machine Learning

Price£8

Origin Price£12

ConditionContains concept of machine learning and examples.

SellerRichard

Buy it Now

Add to Cart

Ask the Seller

Good Detail

An item that has been used previously. The item may have some signs of cosmetic wear, but is fully operational and functions as intended. This item may be a floor model or store return that has been used. See the seller's listing for full details and description of any imperfections.

Good Detail

An item that has been used previously. The item may have some signs of cosmetic wear, but is fully operational and functions as intended. This item may be a floor model or store return that has been used. See the seller's listing for full details and description of any imperfections.

Related Comment

★★★★★

Author: Alculn

Very satisfied

Get to Know Us

Careers

Blog

About Us

Make Money with Us

Sell products on CSM

Advertisement

CSM Payment Products

Shop with Points

Reload Your Balance

Let Us Help You

Your Account

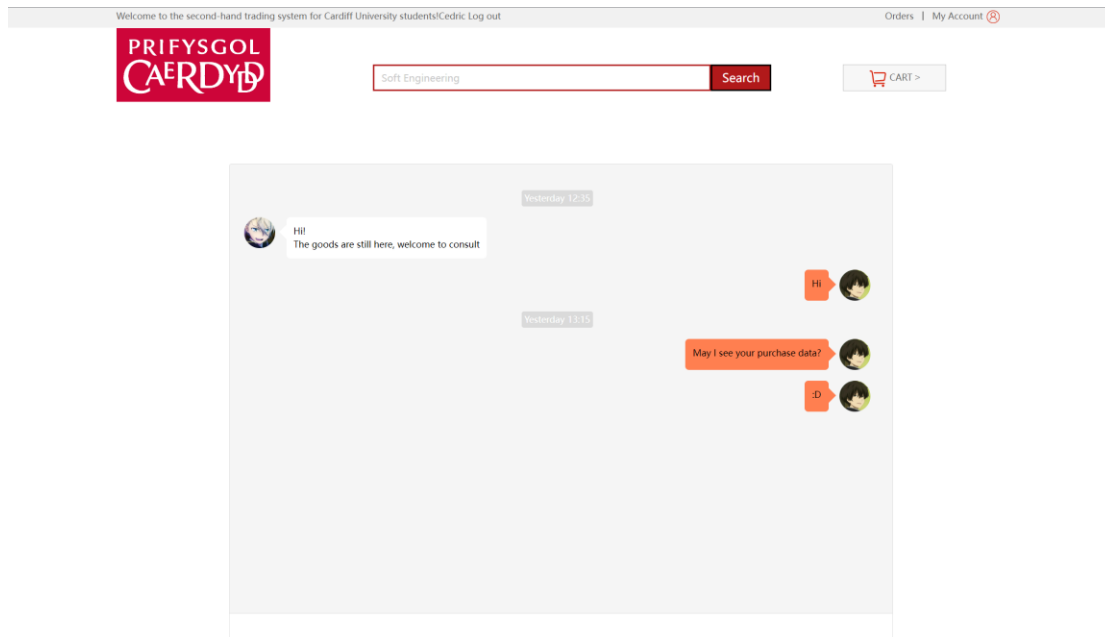
Your Orders

Help

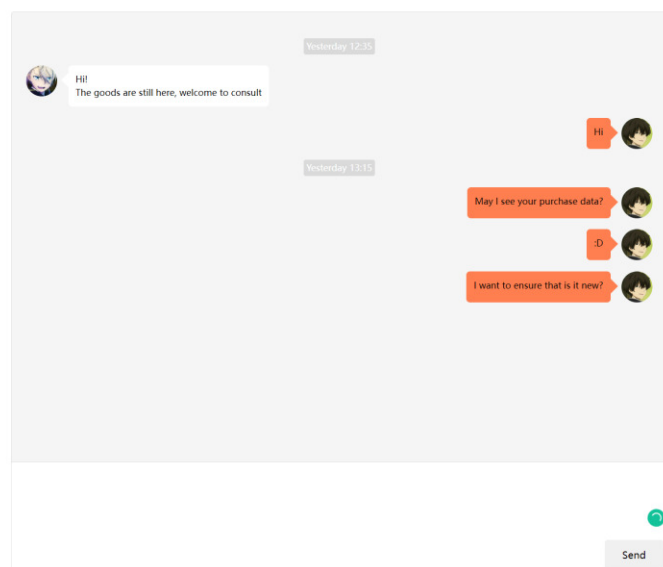
6.8 Communication with Seller

In the Chat page, you can load the previous chat message or input a message to the opposite side.

67 | Page








This is a test of the message function, you can see a message sent out.



6.9 Cart


When the user clicks "Add to Shopping cart", it will jump to the shopping cart page, and it can be found that the book of machine learning has entered the shopping cart list.





<input type="checkbox"/> Select all	Good	Price	Option
<input type="checkbox"/>	 AI 1 Orange.	90	Delete
<input type="checkbox"/>	 Yuga Mats	5	Delete
<input type="checkbox"/>	 iPad Air 3.	450	Delete
<input type="checkbox"/>	 Jellycat Cake	25	Delete
<input type="checkbox"/>	 Machine Learning	8	Delete

You can also select all in the shopping cart, delete the operation. I'm going to delete the yoga mat, and you can see that the yoga mat is no longer in the list.

CAERDYD

Search

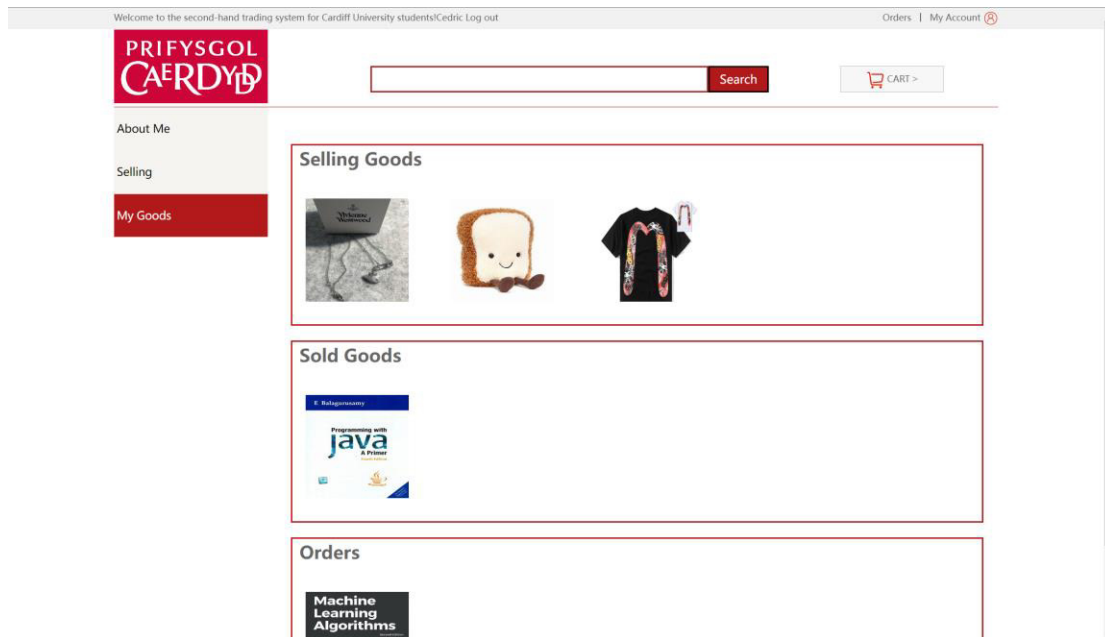
 CART >

<input type="checkbox"/> Select all	Good	Price	Option
<input type="checkbox"/>	 AJ 1 Orange.	90	Delete
<input type="checkbox"/>	 iPad Air 3.	450	Delete
<input type="checkbox"/>	 Jellycat Cake	25	Delete
<input type="checkbox"/>	 Machine Learning	8	Delete

☐ Select all Delete selected goods

6.10 Orders

Clicking orders at the top of any page or my goods on the left side of my page will take you to the following page. It says here that Cedric is selling three things, one of which has already been sold. Ongoing or completed orders are also displayed.



6.11 Post New Item

On the home page, click on post or the button selling on the left side. As shown, the test fills out a sample.

Trade Name
A good name will help your products to be found more easily.

Water Bottle

Category
Find a suitable category.

other

Price
A reasonable price is benefit for your selling.

5

Origin Price
Tell buyers how much your good deserves.

8

Description
Explain why you are selling and the quality of the item.

A gold thermos cup, is a Japanese brand of Thermos. It holds heat very well and la

Picture
Good pictures lead to a successful purchase.

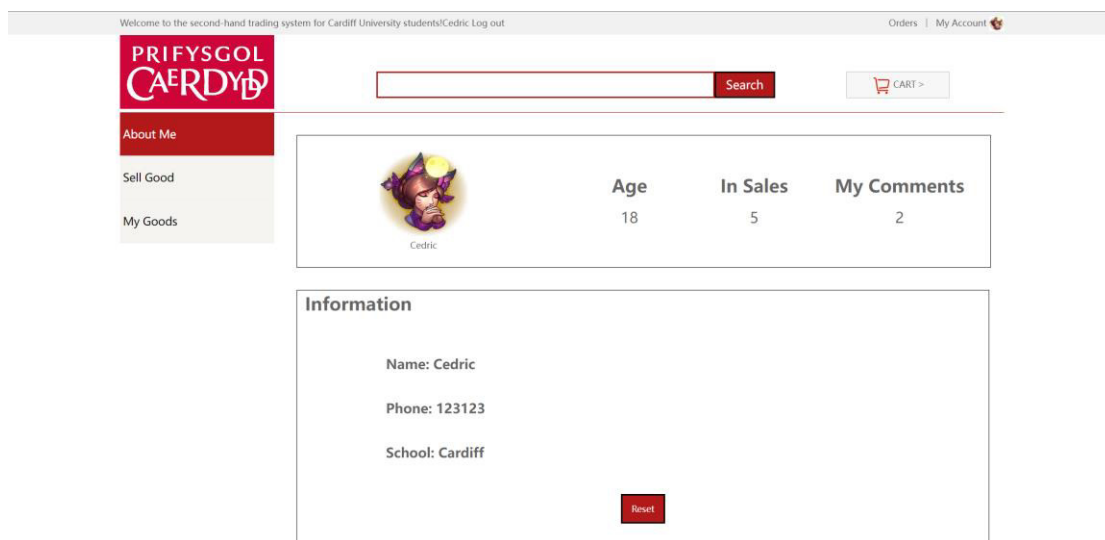
Choose File | 微信图片_20190105133425.jpg

Click Submit, return to the home page, you can see the latest products in the newly added bottle.

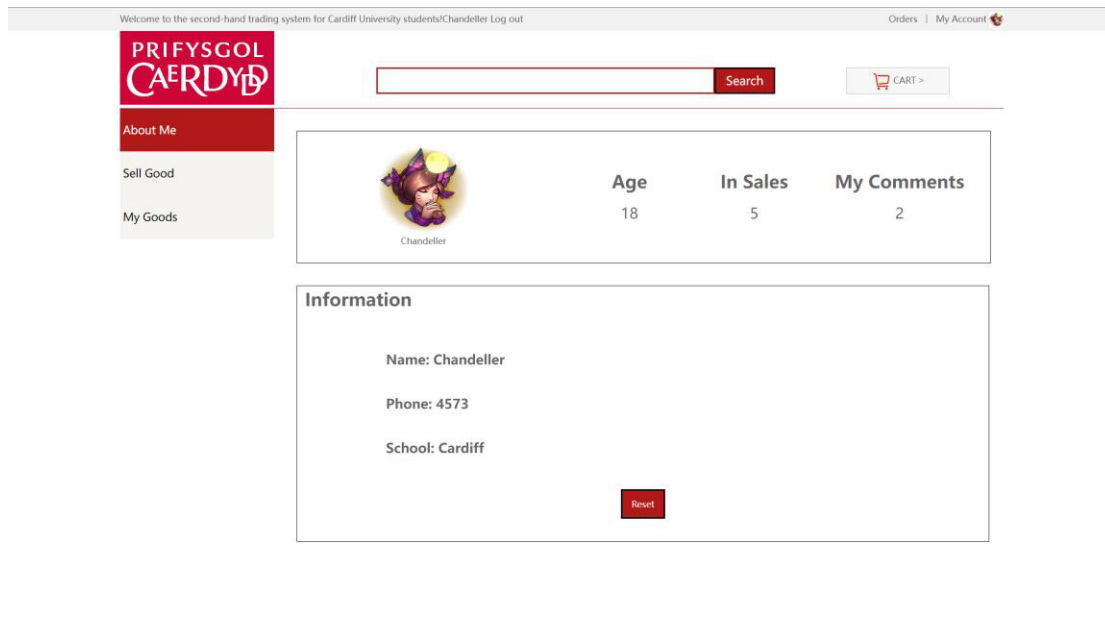


6.12 Personal Information

Click My Account at the top of any page and it will jump to the personal information page.

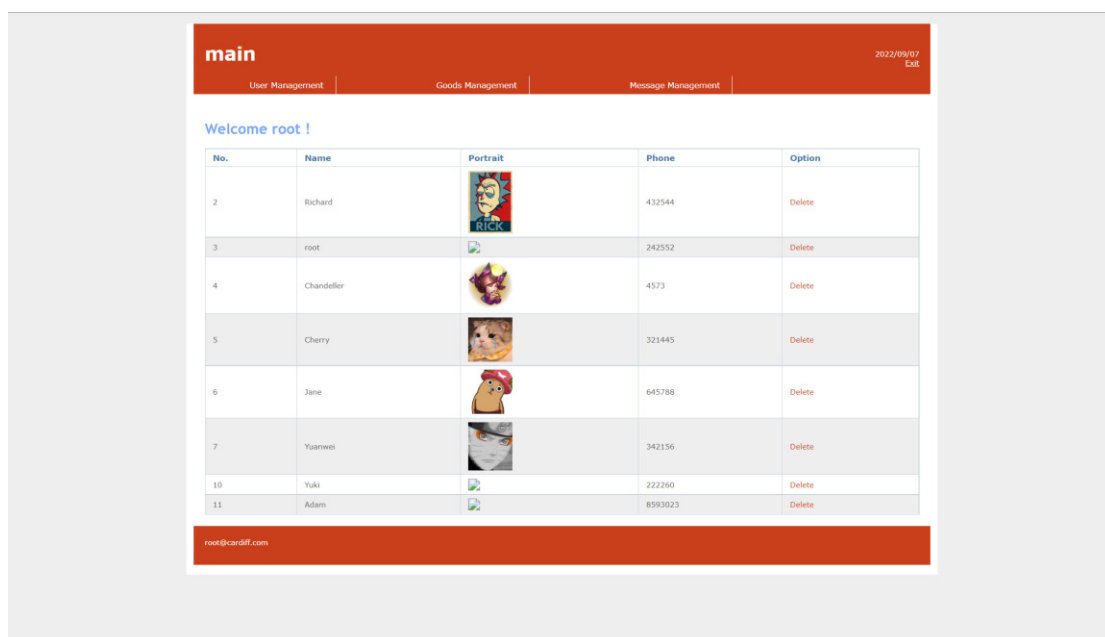


The information here can also be changed, as you can see, the user name and phone number have been changed.

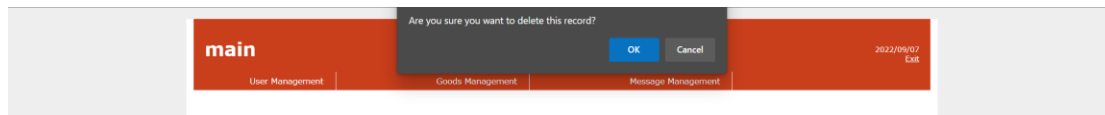


6.13 Administrator

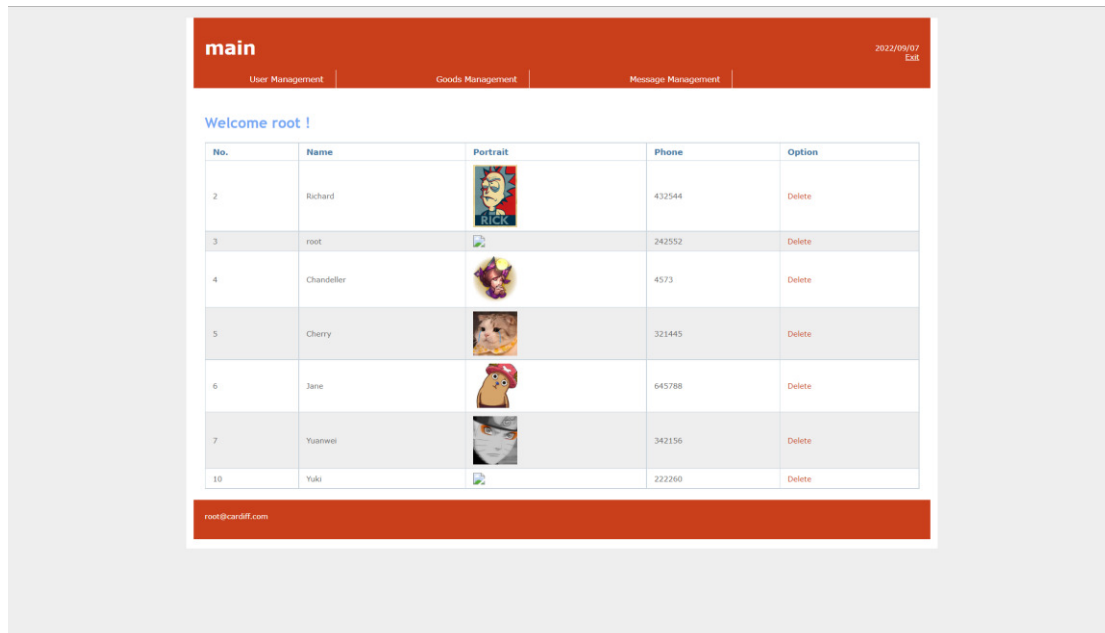
You can log in to the administrator system using the administrator account. Log out of the test user and enter the administrator account. The interface looks like this:



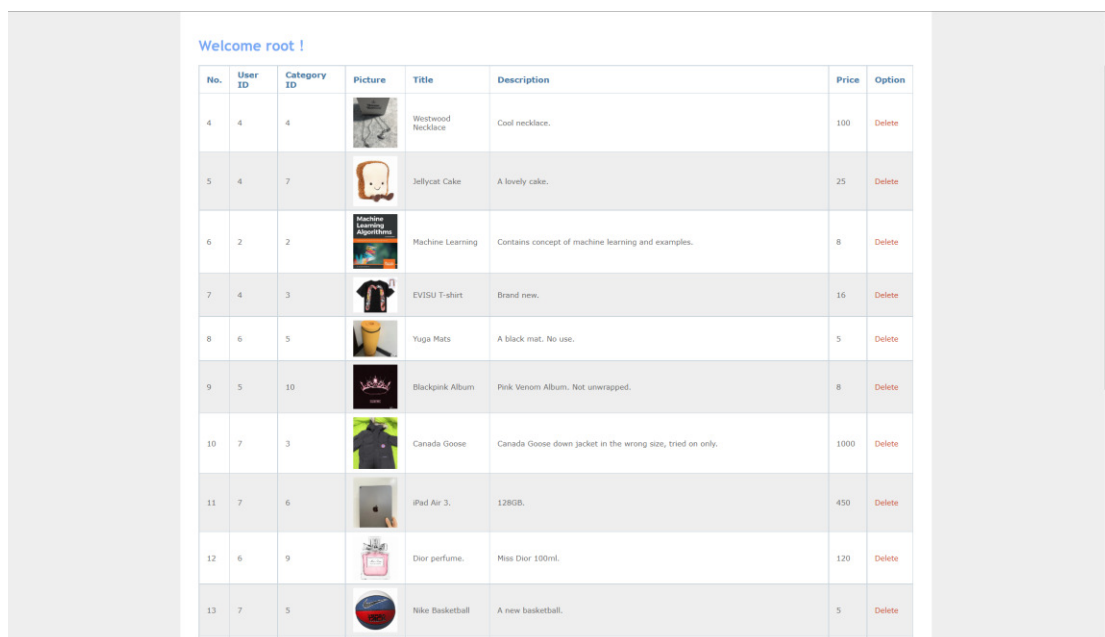
Above is the user management interface, the administrator can log out of the account. For example, performing an operation to log out Adam:



The window will pop up to confirm whether to delete the prompt, click OK, you can see that the user is deleted.



Administrators can also click on the top of the commodity management and message management, you can see all the relevant information of the website, but also can be deleted.



Welcome root !

No.	User ID	Comment User	Rate	Title	Content	Option
1	2	Alcun	5	5	Very satisfied	Delete
2	4	Vae	5	5	The seller described the item clearly and honestly, the price was reasonable and it was a very pleasant shopping experience.	Delete
3	4	Alcun	5	5	The seller is very welcoming, the downside is that I think the price is a bit on the expensive side.	Delete

root@cardiff.com

Chapter Seven: Conclusion and Reflection

7.1 Conclusion

After a lot of analysis of the current situation of the existing second-hand trading market, this project pointed out the existing problems in the trading market - the contradiction between safety and convenience. At the same time, a solution to this problem, while ensuring the convenience of users' browsing, introduces certain user registration thresholds and increases management measures, has also been proposed. Based on this, the author discusses various functions required by online second-hand trading platforms and designs a series of improved functions to ensure convenience and security. So far, the research and design of the online second-hand trading platform has been completed.

Further, the technology required to develop an online trading platform is extremely extensive, including almost all areas that developers need to know. Such as front-end, back-end, database, and the use of front-end and back-end mapping and related templates. After reading a lot of literature and searching for technical resources, this project took into account the degree of adaptation of various technologies and products, as well as the learning costs of various technologies, and finally made the most suitable technical choice, that is, using html/CSS/JavaScript for the front end., the backend uses spring boot, and the database uses MySQL for product development.

Overall, the main outcomes of this project include.

1. A thorough research of the existing second-hand trading market, including web-based and software-based second-hand trading platforms, but also second-hand trading practices using social software or other community-based methods. The strengths and weaknesses of these second-hand trading platforms were analysed and integrated, and the characteristics of a second-hand trading platform suitable for the student community were given.
2. The development of a complete, locally-run second-hand trading platform for

students at Cardiff University. All technology stacks such as front-end and back-end and database have been completed independently. This includes all the basic features required for a second-hand marketplace and enhancements to solve the problems of the existing second-hand marketplace. A good user interface and back-end logic was designed to meet the requirements and to store all the required data in a database.

7.2 Reflection

There have been a number of times in the progress of the project when problems have arisen that have caused some stagnation in progress. Each of these issues is worth reflecting on, as each is a common and significant challenge for developers.

One is during the requirements analysis and prototyping phase. This process is in fact far more elaborate and complex than anyone without this experience can imagine. Although it is only necessary to roughly document the functions in text form and to draw an easy-to-understand prototype based on these functions, this is still difficult, especially for a project such as the second-hand marketplace, which is more multi-functional and has click-and-interact as a functional theme. As a page can contain a large number of different clickable buttons, there is a high risk that small buttons that should appear on a particular page are inadvertently overlooked. At the same time, because the number of possible pages is so large, the logical relationship between these pages needs to be clearly indicated. This leads to a process where the task is thought to be almost complete, but at the end there are still countless logical and interface features that need to be sorted out. In my opinion, this is an extremely experienced task, as the analyst needs to be able to quickly capture the vast amount of requirements and know exactly which trivial keys need to be pointed out. This is certainly an essential skill for someone doing this job. I think the improvement I have got from this work is huge. Having quickly acquired these analytical skills, I am now faced with a product, a requirement, and I now have a strong ability to get to the point and solve it.

Secondly, during the development process based on the prototype diagram, I

encountered many challenging problems. Such problems include two aspects, one of which is requirement-based and the other is technical. Requirements issues refer to omissions in requirements analysis and prototyping, often because analysts miss the fact that "there is a problem to be solved here". A typical example is where the author has designed functionality to ensure that users can log in, register and log out freely, and that after logging in, they will be redirected to the home page. However, this issue was ignored in the "logout" section, so that after logging out of the account, the user's page would show error 502, which was not discovered until the final test. Obviously, as mentioned above, this is also a capability that needs to be improved with experience.

Technical problems are those where the developer finds it difficult to achieve the required functionality with the existing technical means. For example, in this project, the chat function was significantly impacted by the fact that the entire project was running locally. Locally, tcp directed links could not be established, and messages sent by any user would not reach the other user's account correctly. It should also not be allowed to use the database to store users' chat data directly, given the privacy and security of the users. As this issue is well addressed when deployed to the cloud, the approach of this project was to leave an interface and implement a chat page as a presentation of the functionality. Similarly, there were cases where the data could not be called in the front-end and back-end mappings. Again, this type of problem occurred with great frequency, and each one provided the developers with technical experience and practice in problem solving. Once these problems were solved, the author's development skills improved significantly and the project was eventually completed with a lot of practice. It is worth reflecting that in the process of technology selection, there are still quite competitive options, such as the node.js framework, which can greatly avoid the problem of front-end and back-end mapping, but for the consideration of learning cost, this project did not choose, and the final result also proved that adaptability is actually very important and affects development efficiency. Although the final product is still developed, in the future, if production development is to be carried out, adaptability should still be the primary consideration.

The current level of completion of this project can already be used as an application to provide services online, but if it is to be a mature product and attract enough users, there is still a lot of room for improvement, such as the accuracy of the search function and the deployment of the chat function, etc. Likewise, the tasks mentioned here have drastically changed my tendency to get overwhelmed when dealing with code. I am now more confident and able to solve problems with confidence when dealing with complex code logic and debugging, which will help me in my future career in this field.

In the future, the project hopes to be deployed on the cloud and to allow real users to become users of the project, in order to truly achieve the original purpose of the project: to facilitate second-hand transactions for students at Cardiff University. At the same time, the project will be constantly updated and iterated to optimise the user interface and back-end logic. Some non-essential features will also be developed in the future to meet the changing and evolving needs of users. This project will be continuously optimized, and strive to provide a high-quality online second-hand trading platform for students of Cardiff University.

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