VolleyFans

COMP0201 Coursework

Word Count: 4999

1. Introduction

This project, namely VolleyFans, aims to develop an application to provide clubs and teams across the UK with a simple and intuitive way to purchase volleyball products online. Recently, the goto volleyball gear provider in the UK Sportset has closed down, leaving the only option for customers the official shop provided by Volleyball England, this project aims to provide an affordable alternative for users and many options to pay with. While the platform aims to be easy to use for all users what sets us apart are the options for payment. Traditional online payment methods such as Bank Transfer, Apple Pay, Credit/Debit Card, Klarna will still be offered via Stripe, but we will also offer an invoice option for clubs and universities. From previous experiences many clubs have a bureaucratic process of trying to get money back from the student union for purchases, requiring an official invoice from the supplier before they'll pay the money out, resulting in a delay of receiving deposits and products on both ends.

The Agile development process will be used to develop this application, specifically the Kanban framework, continuously delivering working software and welcoming changing requirements. This report will include user stories, product backlog, design models, basic prototype, and working interface code.

2. Requirements Gathering

2.1 Competitors Analysis

Market research and analysis was conducted to investigate competitors currently providing ways for users to purchase volleyball equipment. Two main avenues, one being Volleyball England's official store VolleyStore, the other being typical sports giants such as SportsDirect, Amazon etc. The recently out-of-business Sportset will also be briefly mentioned.

 Sportset was the premier equipment supplier for clubs and teams across the UK as well as the national governing body of volleyball, Volleyball England. They have provided the volleyball community a service and supply chain for 33 years before closing down in early 2023. They were more or less a one-stop-shop for most of the equipment needs for clubs as well as accessories for players. Following their closure the company has been purchased by Harrod Sport, the manufacturer behind their volleyball posts all these years and now only offer indoor and outdoor volleyball posts, volleyball nets manufactured in the UK. For many years since there was basically

no competition, they have been allowed to set prices however they wish, but even then it could be seen that their business model was not working out, either due to the high supply prices that they couldn't keep up with or just the general lack of demand, forcing them to close down.

VolleyStore launched in June 2023 following Sportset's closure aiming to provide clubs and members with a new one-stop-shop for all equipment needs, also enticing affiliated clubs and members with discounts and promotions. Their website resembles a typical e-commerce website, sleek and intuitive design to find products easily, loads decently fast, and a straight forward checkout system similar to many other websites. They offer a very small discount on bulk buys, but other than a limited selection of balls, a decent variety of posts and nets, and some accessories they don't offer a huge variety of personal gear such as shoes, kneepads, etc. They also don't have a wishlist of some kind for customers to keep track of products.

Other than the two competitors mentioned above, there are also a whole host of individual sports retailers that sell some volleyball gear such as shoes, kneepads, and more. SportsDirect, DirectBadminton, SportShop, Amazon etc. just to name a few. However, these brands don't particularly specialize in volleyball gear, more so just extra products added to their catalogue, they are unable to provide insights and professional help, and are also usually limited in options and sizing. The benefit to these big retailers are their trustability and reputation, customers don't have to worry about being scammed and can trust the delivery times advertised on these sites, as well as well established refund policies.

2.2 Focus Group Interview

When thinking about the possible stakeholders of this application, a focus group of relevant stakeholders were gathered to conduct a semi-structured interview to identify and document requirements from our targetted users. The focus group consisted of 8 people with a range of experience and personas within the volleyball community. Ranging from individuals on committees of university clubs, to individuals on league committees and long standing club members. The questions asked can be found in the appendix.

The first few questions identified that everyone has purchased some form of equipment within the last calendar year, all through different means. Some had members from other countries bring equipment back, while some had located online sources from Europe and shipped it over. However, one thing consistent with all members was the

wait time, with shipping taking over two weeks and members bringing equipment back from other countries aren't a reliable avenue to transport products. This presents a potential for incentivizing users to purchase with us instead if we can shorten waiting times.

All members were aware of the launch of VolleyStore and expressed that they were all previous customers of SportSet and was saddened by their closure. However, other than buying scoring equipment from VolleyStore such as scoresheets and line-up pads none of the members have purchased anything else from VolleyStore due to a multitude of reasons such as: Balls and certain accessories are way too expensive, there are no options for individual accessories for juniors looking to get into volleyball, all around just not much incentive for us to purchase from them. From these responses we can gather some main issues with VolleyStore being pricing and variety, something we can focus on for our website.

With Question 6 we tried to identify what specific products are people most looking to buy and we received a range of answers. Most members voiced their want for cheaper options to purchase balls, as well as a want for more variety of kneepads and volleyball shoes. Question 7 follows on from the previous question, members are frustrated with the lack of options in products and suppliers, often struggling to find what they want and overpaying for it. Some members also said that when trying to buy products from certain websites, they often lack in size or when trying to pay will say out of stock, with no indication of when it'll be back in stock, causing frustration and having to look somewhere else.

Question 9 and 10 reveals some aspects for what the members prioritise on a website, members came to a consensus that these they goto a volleyball equipment website with a goal, most of the time knowing what they want, unlike just casually shopping on Amazon buying things they think they might need. Following that they indicated all they want is a website that is easy to navigate and just works, able to find what they need and purchase what they need with minimum hassle at an affordable price. With clothing and shoes they would like a proper size chart for that specific brand as a lot of websites don't provide that or are hard to find.

Question 11 and 12 relates to the finances and purchasing power of these clubs. Members have commented especially for clubs in London, volleyball is quite an expensive sport to get into, with regards to the amount of things they have to pay for every season, such as courts, league registrations, referees etc. This puts a lot of burden on clubs to keep membership prices at an affordable price, while still having enough of a budget to purchase equipment as necessary, and so any options to

bulk-buy and save on costs are welcome. Some older members of clubs have also voiced their concerns with online payment systems, afraid of security and paying with their credit cards online.

Furthermore, as predicted with committee members of university clubs, purchasing equipment is a big hassle, most of the time requiring the members to purchase said equipment themselves, and having to wait weeks before the university pays them back. They would like a way to combat that, whether it's the university directly paying the supplier or other methods where it wouldn't put the student in a difficult financial situation.

2.3 Questionnaire

After the focus group, a short multiple-choice questionnaire was sent out to individuals within the volleyball community to understand their preferences and needs with regards to a new online volleyball shop. This was conducted as we felt the need to gather opinions not just from the perspective of people operating clubs, but individuals who could benefit from this new website, 50 individuals responded to this questionnaire. These questions can be found in the Appendix.

In Question 1, over 90% of participants said it's extremely difficult to purchase volleyball gear within the UK, and majority are unsatisfied with the limited selection that's available online. This provides a big potential for us, just by sourcing and giving people more options we would have filled a big gap. With Question 3 over 80% of individuals were willing to wait a bit longer for their products if given more product options and affordable prices.

Question 4 attempted to pick out some key factors that participants consider when shopping for volleyball gear online. The highest two factors being price and product availability and selection, with the least important ones being customer service and return policy. This information will be useful in prioritizing features to implement in the final application.

With Question 5 there was a close 60/40 split in people going online with something in mind and just shopping around. Question 6 resulted in 75% of participants saying they would happily buy an alternative if it was on sale, this response along with responses to Question 5 could help us shape what we put on the front page for customers to see. Finally, most people replied with Debit Card and bank transfer for payment methods they're most likely to use for online shopping.

To analyse and conclude on responses gathered in section 2.2 and 2.3, here are some features that would be included in our application:

- Alternative payment option for university clubs (Invoice)
- Display popular/on sale products on front page for easier access
- Simple to navigate and intuitive website interface
- Provide a large selection of products
- Provide detailed product information on pages (size charts, materials, specs)

2.4 User Stories

User stories are a simple way to articulate software functionality to deliver an outcome to an user. These narratives follow a structured template, emphasizing a user's role, their desired action, and the expected outcome. These stories can make sure development teams, stakeholders, and end-users are all on the same page when prioritizing features based on user value.

1) As a customer who occasionally buys volleyball gear online, I want the online shop to provide clear and detailed product descriptions, including size charts and materials used, to ensure I make informed purchasing decisions.
2) As a user who values pricing, I want the online volleyball shop to offer competitive prices compared to other retailers in the market.
3) As a customer who is worried about online payments, I want the online volleyball shop to use secure and encrypted payment gateways to protect my personal and financial information.
4) As a university committee member, I want the shop to provide alternative ways to pay so that I won't have to bear the financial burden
5) As a user who appreciates recommendations, I want the online volleyball shop to provide personalized recommendations for easier navigation.
6) As a customer who values variety, I want the shop to offer plenty of options for me to choose from.
7) As a user who just wants to buy what I need and get on with it, I want the shop to be intuitive and simple to use.

2.5 Backlog

The backlog is a prioritised list of work derived from the requirements and user stories gathered above. As this project will be completed via the Kanban framework, the product backlog will be in the form of a Kanban board via Jira, of which the final version of the backlog is included in the Appendix.

3. WebApp Vision

VolleyFans is an online volleyball-centric shop designed to provide affordable prices and plenty of variety via an intuitive and easy to use website. The website will provide detailed product descriptions as well as personalized recommendations, as well as alternative ways of payment to ensure all customers can get what they need and want. The primary goal is to become the go-to source for all individual accessories related to volleyball with unparalleled options, online shopping should be easy-to-use and users should not have to worry about security of payment.

3.1 Front Page

First impressions matter, and the landing page is arguably the most important component of the whole website. While not wanting to overload the user with too much visual stimulus, we believe there should be two things present here: most popular products, and products on sale. There is no need for a useless landing page with just a big logo, we want customers to be able to find what they need and fast, and for customers just browsing, nudge them in a certain direction with discounts.

3.2 Payment Options

Along with typical payment options mentioned previously via Stripe, we want to offer an option for individuals buying on behalf of universities or clubs that require an invoice. The website will generate an invoice that the user can send to the respective parties and we receive payment directly, reducing the time lag and potential financial burden placed on the middleman, in this case the individual making the purchase.

3.3 Products

We want to highlight the amount of variety that we have, so not only should the site be bursting with options, but also detailed descriptions for each product with regards to material, size charts, and more, we want the customer to have full information on what they're purchasing without having to go off and do their own research.

4. Analysis and Design
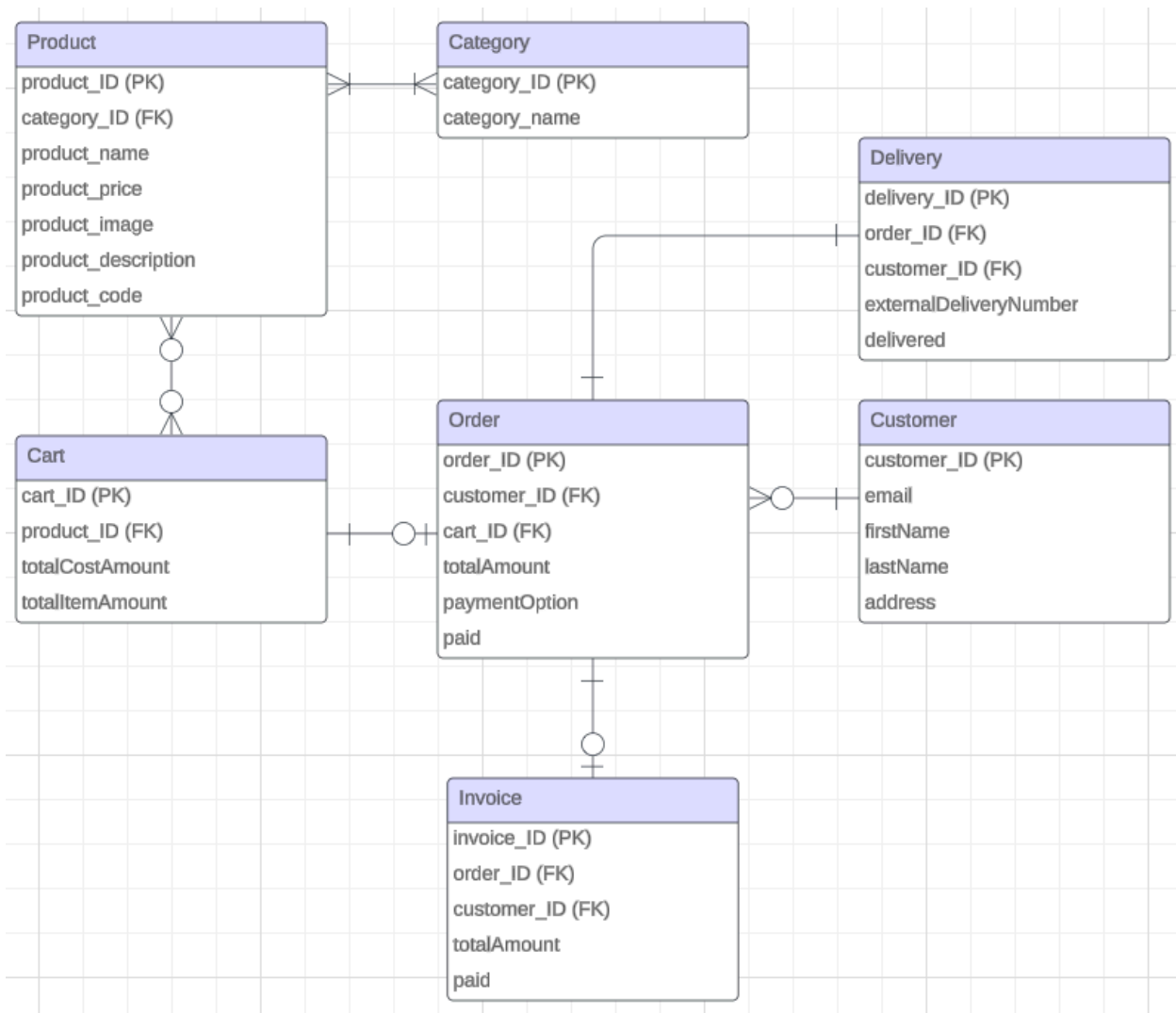
4.1 Database Schema

Figure 1 - Database Schema

The above database schema provides a graphical representation of all the entities within our database and the relationships between them, it's a high level specification of the database's structure and components, but in this case the various data types are not specified.

For the **Customer** table, while users won't be required to login to browse the website or save their cart (done via cookies), if they want to purchase something they will either be required to enter basic information such as name, address, and email or they can choose to login via OAuth. That way users will not have to create a new account with

us, and can be rest assured with regards to security as authorization is handled with the relative third party such as Google, Facebook, etc. The **Customer** table has a one to zero-or-many relationship with **Order,** as each order must have one customer, while customers can have zero or multiple orders.

The **Order** table is the center attribute of the whole system, with order_ID as it's primary key, taking customer_ID and cart_ID as it's foreign keys, it tracks each individual order made by a customer and has relationships to **Delivery, Invoice,** and **Cart**. It also tracks what payment method was used as well as the status of the payment.

The **Delivery** table is used to track whether an order has completed it's delivery to the customer yet, taking in two foreign keys as well as external tracking numbers provided by mailing services, it also has an attribute on whether the order is delivered or not. It has a one-to-one relationship with **Order** as each order should have exactly one delivery and vice versa.

The **Invoice** table is an optional table that's only used when customers select the invoice option when choosing payment options, it contains order_ID and customer_ID as foreign keys and also tracks whether it's been paid or not. It has a zero-or-one to one relationship with **Order** as it's not a mandatory relationship, but if there is one it should only point to one order.

The **Cart** table serves as an intermediary between **Products** and **Order**, it fully tracks what products are selected and it's total cost, allowing the **Order** table to reference it via a foreign key when users are ready to pay. It has a one to zero-or-one relationship with **Order** as each individual cart doesn't necessarily have to be related to an Order, but an Order should always be pointed to one cart.

Finally, the **Product** table is used to track each individual product, there will be an individual product_ID for each product such as different colored shirts or sizes or shoes, that's what the product_code attribute is for, to identify which specific color or size the product is. It has one of the most open relationships with **Cart**, a zero-or-many to zero-or-many relationship as neither are reliant on each other. It also has a one-or-many to one-or-many relationship with **Category**.

4.2 Architecture Diagram

An architecture diagram provides a visual representation of the structure and interactions within the application. It helps convey the system's design, including the arrangement of frontend and backend components, databases, and any third-parties. It

aids in decision-making within a team and serves as a reference for ensuring the intended design principles and goals are followed throughout the development cycle.
Key Components Identified:

Frontend: User interface/experience, the visual layer that users interact with, including components such as all the web pages, buttons, forms, client-side logic (JavaScript)

Backend: Application Server, where the business logic of the application is contained. Handling user requests, processes data, and communicates with the database

Database: The database server where the application's data is stored. This includes the database management system (MySQL), tables, and schemas.

External: These include third-party APIs and other services. In our case this would include Stripe as our payment system, and OAuth as the external authentication service.
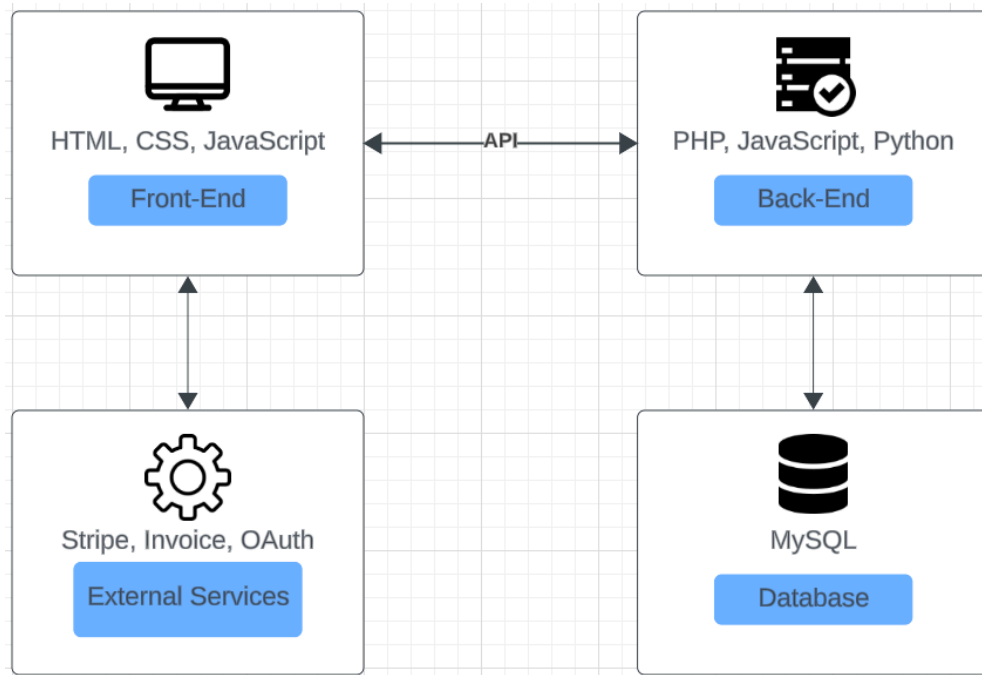

Figure 2 - High-level architecture diagram

5. Prototype

A prototype is a preliminary model that provides a tangible representation of the application before it undergoes full development, it allows stakeholders to interact with and evaluate the overall functionality and feasibility of the project.

5.1 Low-fidelity Prototype

Figma wireframes were used to create our low-fidelity prototype, by using basic shapes and text boxes it was enough to show the basic design of the website.
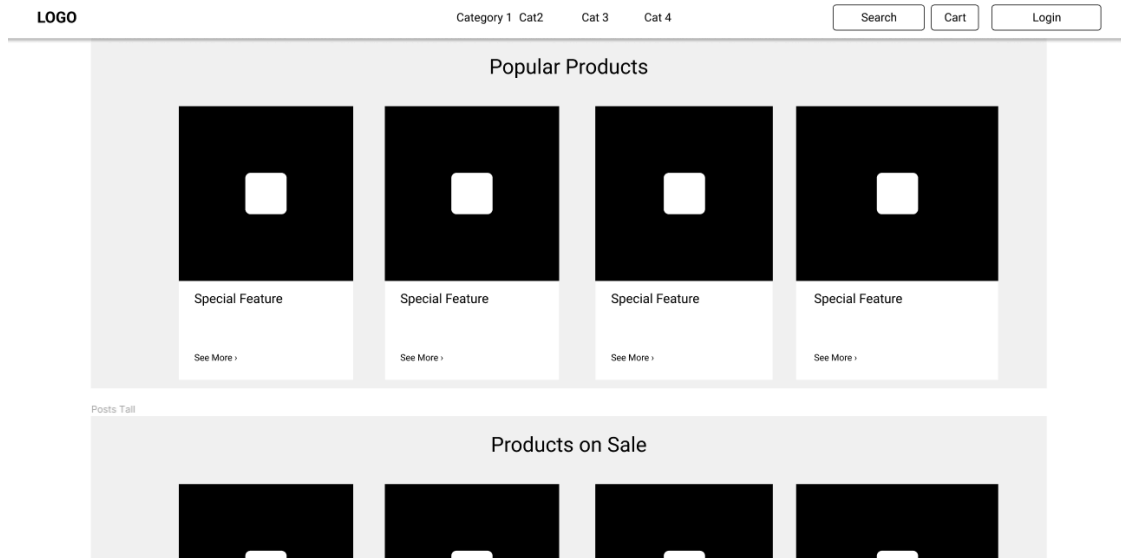

Figure 2 - Landing Page

As mentioned earlier with regards to the most important page in the whole website, the landing page. The key features of this being popular products and products on sale being displayed, making it a high chance for users to immediately see what they want to buy. The navigation bar also contains the various categories of products, as well as a search bar, the cart and a login function.
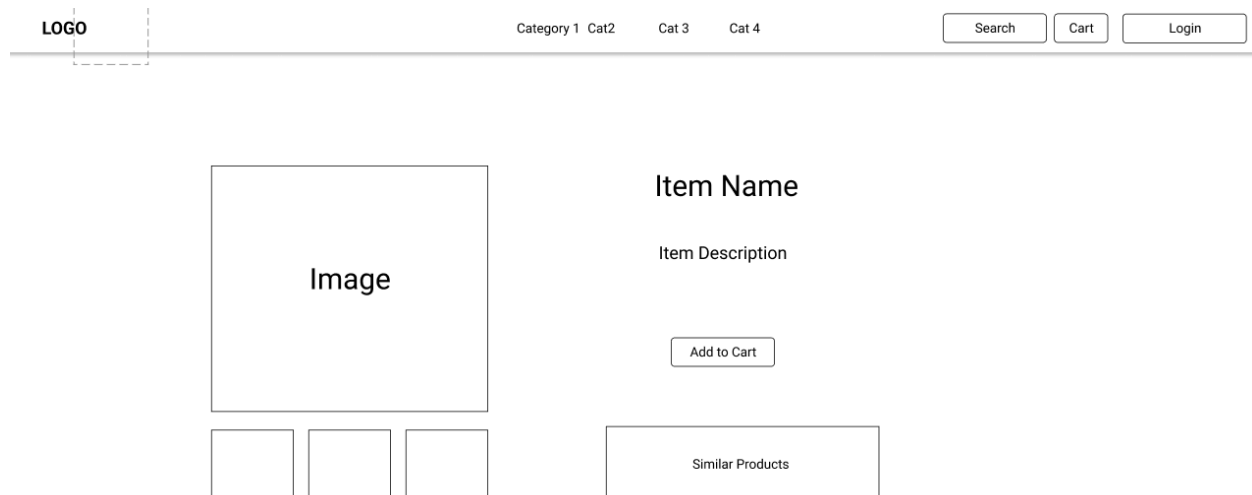

Figure 3 - Product Page

A simple product page that provides the user with everything they need, as well as a similar products section recommending similar items.
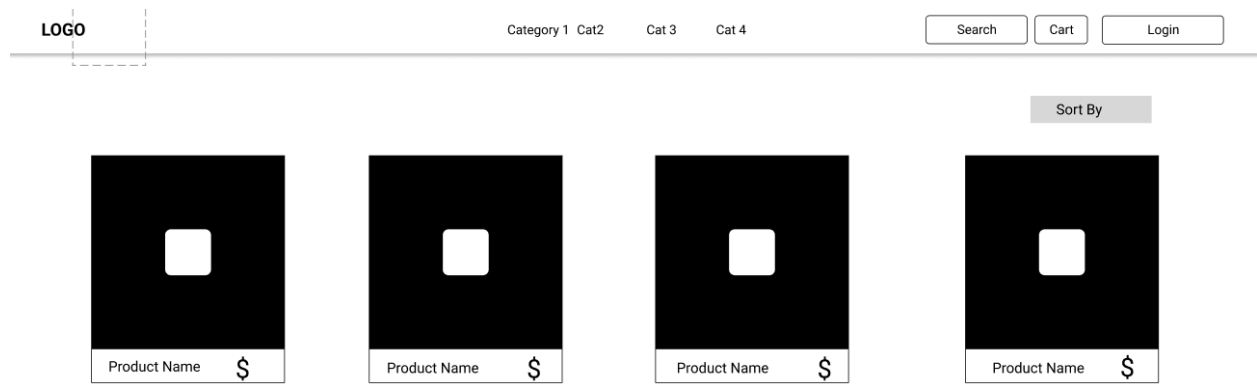
Figure 4 - Categories Page

This is where users can see a list of products along with their prices, a "Sort By" dropbox is also available for users to sort the products by alphabetical order or by price etc.
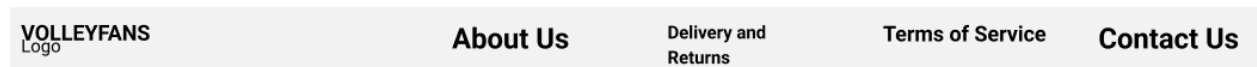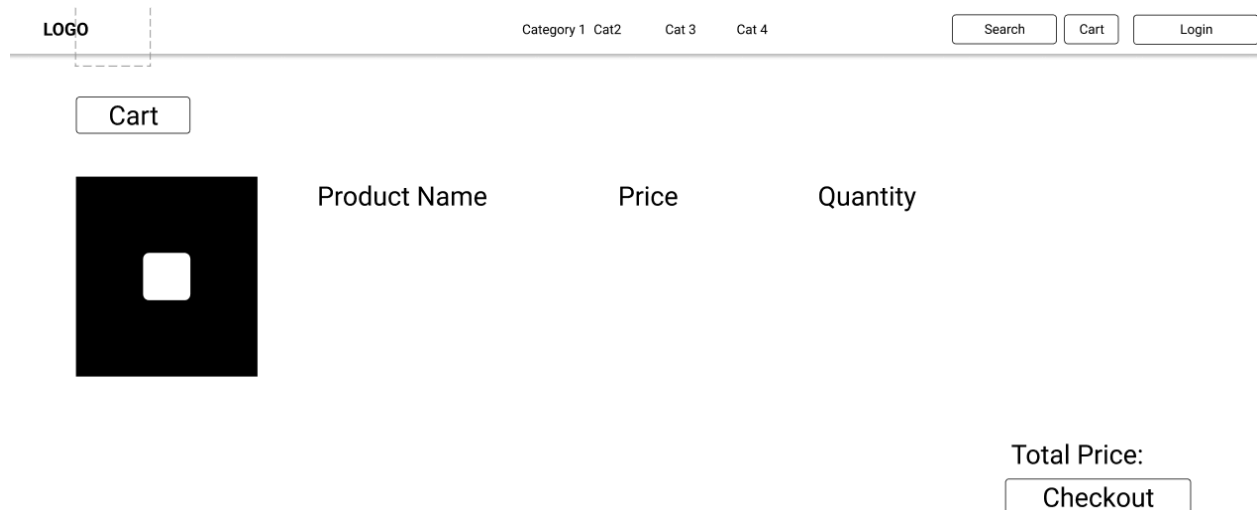

Figure 5 - Footer

Figure 6 - Cart Page

A simple page to see all items in your cart, displaying the product name, unit price, quantity and total price before checkout.
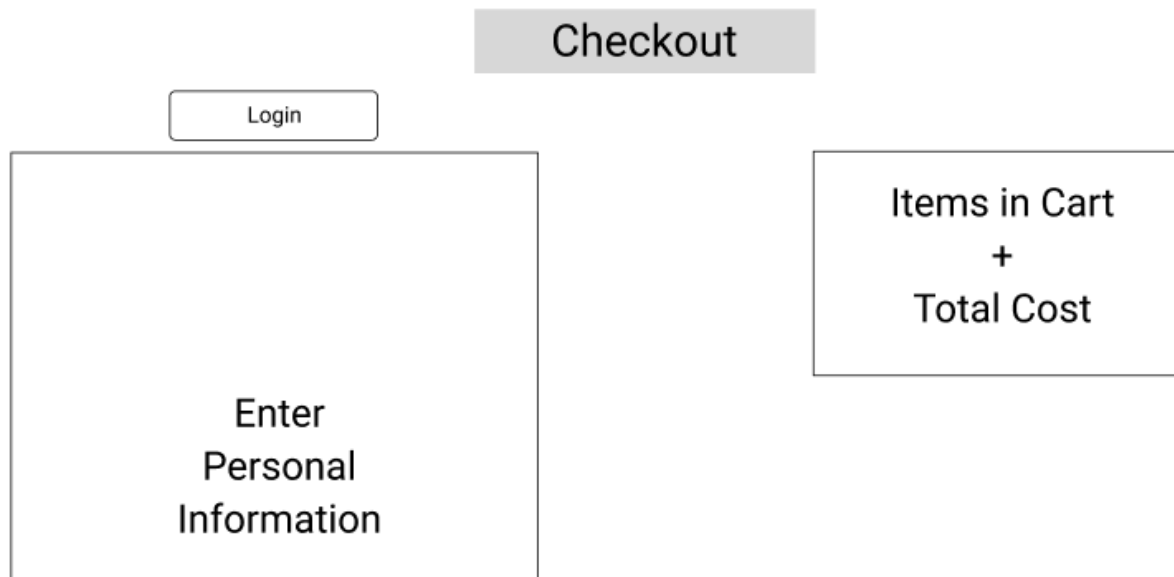
Figure 7 - Checkout page without being logged in

If the user hasn't logged in or doesn't have their personal information saved, they will be required to enter them here before shipping costs are calculated and payment options are available, they can also choose to login at the top. Once the personal information is confirmed, the box on the left will change to display the several payment options available.

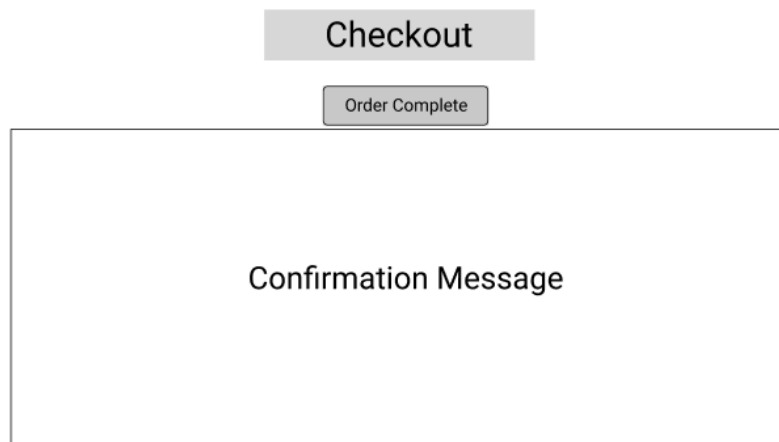*Figure 8 - Order Complete Page*

If a traditional payment method has been processed and confirmed by Stripe, the confirmation message will show something along the lines of payment received, you'll receive a payment shortly. If the user has chosen the invoice option, a downloadable invoice would be generated for them along with a deadline, the confirmation message will be adjusted accordingly.

Majority of these wireframe prototypes has been designed with simplicity and ease of navigation in mind, with the main goal for users to purchase what they want with as little hassle as possible and with any payment option they choose.
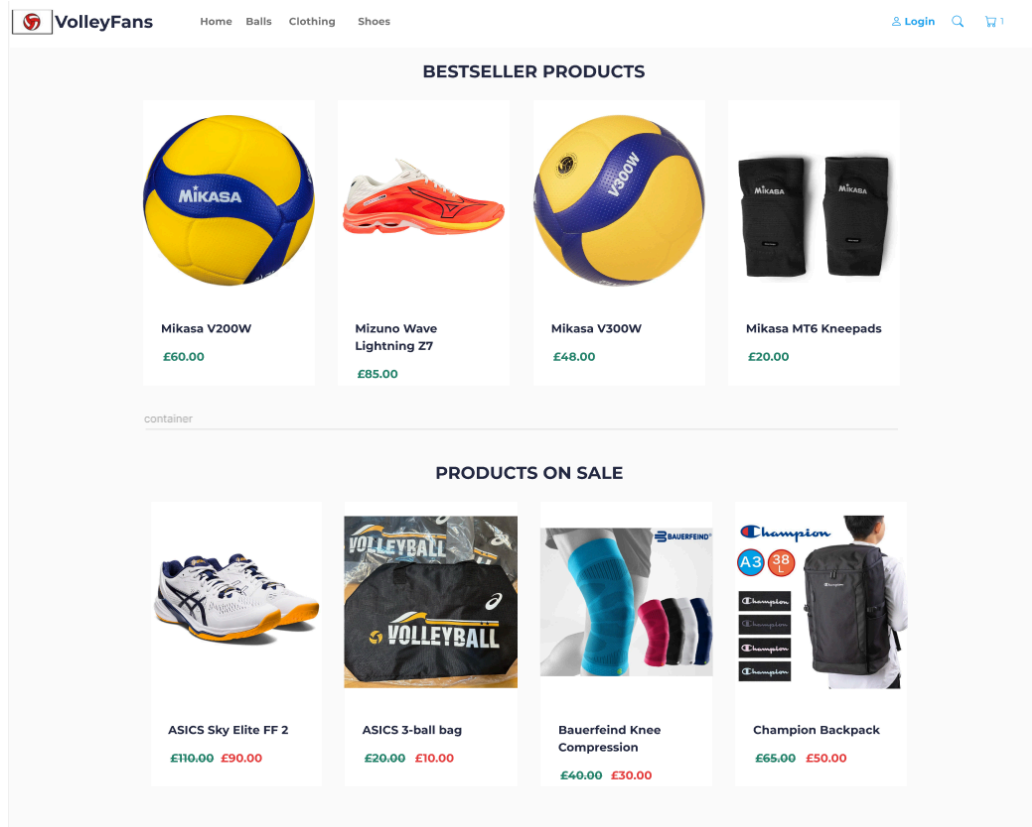
5.2 High-fidelity Prototype

Figure 9 - High-fidelity landing page/home page with Nav Bar

The page of products for each category would look similar to this just with more products and without the Bestseller products and products on sale text
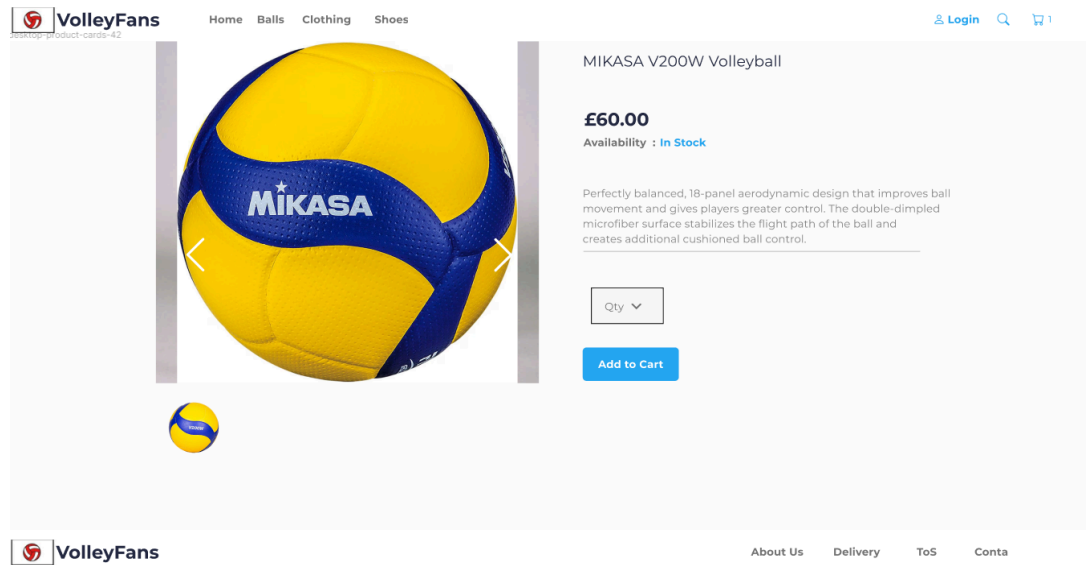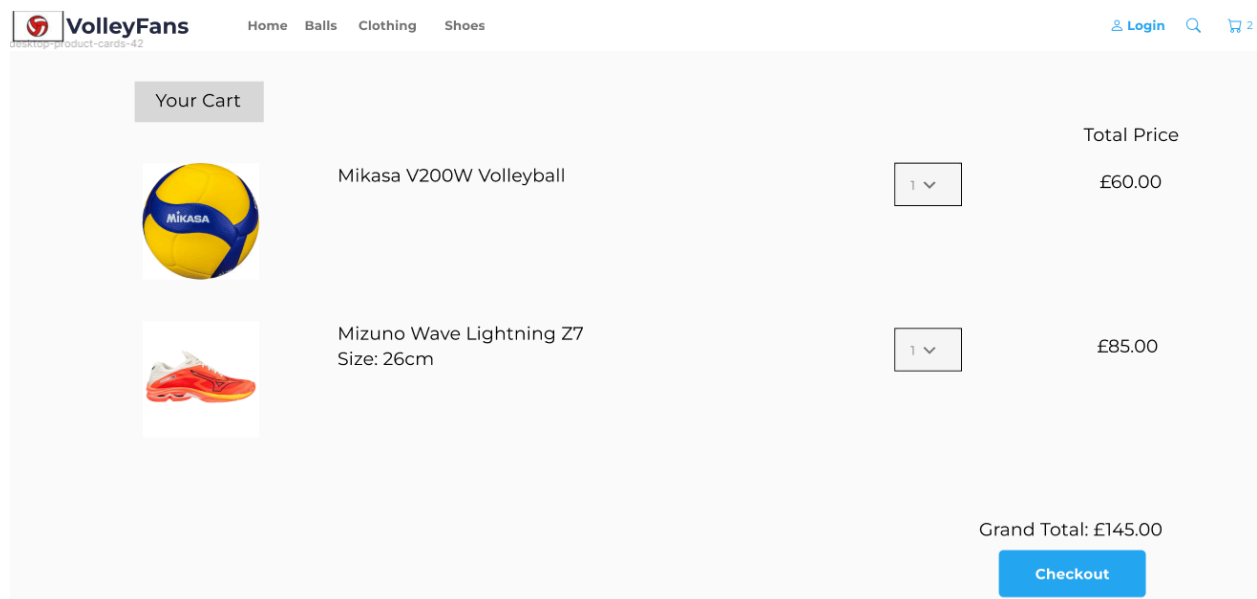

Figure 10 - High-fidelity Product Page with Footer

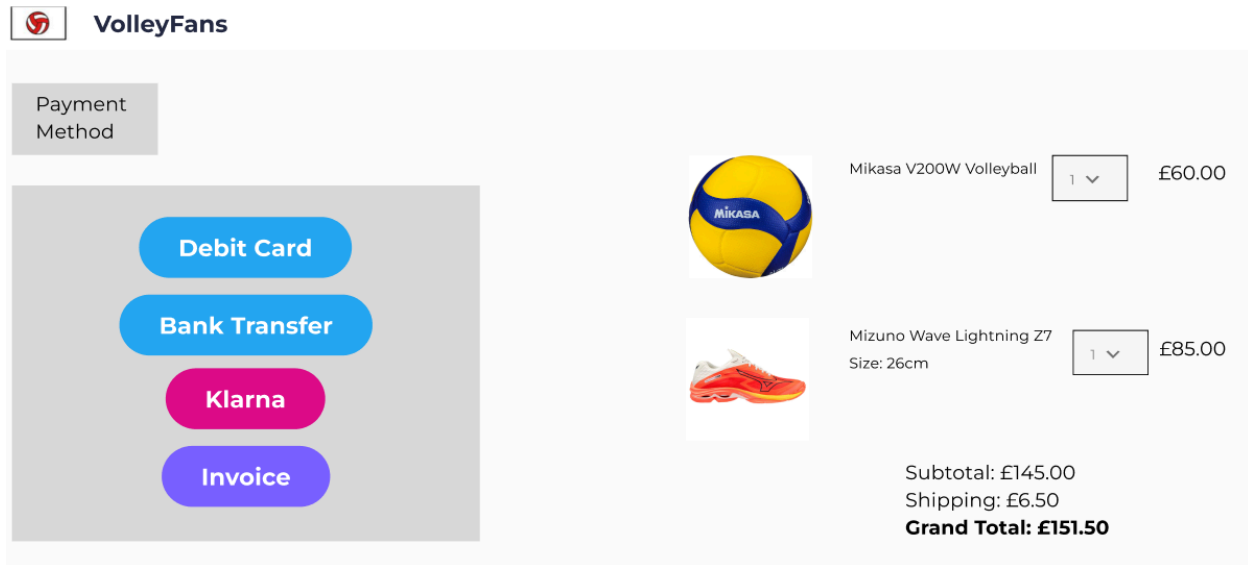*Figure 11 - High-fidelity Cart Page*

Figure 12 - High-fidelity Payment Page

Depending on the option chosen by the user, they will be redirected by Stripe to handle their respective payment method, then followed by a confirmation message and email confirmation. If the invoice option is selected, a custom invoice will be sent to their email with further instructions on how to proceed. The interface has been designed to be minimalistic and simplistic, with an intuitive navigation and self-explanatory buttons to get straight to the point.

A typical path a user might take includes taking a look at the category they're interested in, picking an item and looking at Figure 10, they would then add the desired item to their cart. Next they would visit the cart page on Figure 11, confirming what they're purchasing before pressing the checkout button where they will be taken to a page where they can fill in their personal information. Finally, being greeted with Figure 12 to pick a payment option and complete the buying process.

6. Implementation and Testing

To start the development process, a basic skeleton webpage including all essential components of the project was created. The primary focus here is to create a user interface that somewhat resembles the high-fidelity prototypes, functionality can be added at a later stage. Buttons to navigate between the existing pages were then added to add a basic level of functionality.

6.1 Functional Testing

Functional testing involves developing a large set of test so that every aspect of a program is executed at least once, the testing process continues until there is a complete system ready for release.

Unit Testing - This is where developers will test code units in isolation, done by the developer as code is being written. A code unit is anything that has a defined responsibility such as a function or method. In our case an example would be to test the function that calculates the total price of all items in the cart. The unit test should not only cover doing what's expected correctly but also see how it handles cases such as an empty cart or invalid items.

Feature Testing - This is a direct test of user stories and requirements gathering conducted earlier in the process, it's an important step to make sure that the functionality meets the real needs of users. User stories should be able to be identified and tested, ensuring the whole journey for the story works seamlessly.

System Testing - A comprehensive testing method that involves testing the system as a whole, rather than individual code units/system features. The team can engineer a real life scenario that aims to interact with all parts of the system, similar to how a real user would interact with the website. For us, this starts from the user opening the website, navigating through the different category pages and eventually picking a few products and adding them to the cart. They would then proceed to checkout, fill in their personal and shipping information and be able to complete the payment and receive a email confirmation. All steps should be executed without any errors or unexpected behaviour and everythin should be accurately recorded in our system.

Release Testing - This is the final test before the app is deployed to a wider audience. The main goal of release testing is to ensure the software meets quality standards and determine whether it's good enough to release. The system will be tested in a real operational environment with a select group of individuals, more complex real world data will be involved to test the reliability of the app in a real world context. Once this stage has passed it can enter the final stage before deployment.

7. Next Iterations

Once all functional aspects of the website is established and up and running with no bugs, the team can start focusing on some of the features we didn't have time to implement. A wishlist that not only allows the user to store products they would like to

come back to later, but could also notify the user when something in their wishlist goes on sale. A better way to add products to the website for the owner could also prove to be beneficial as it's unfeasible for our team to hard code a product everytime the owner wants to add new products.

As the website begins to gain more traction, further interviews or questionnaires can be conducted with the community to see in what ways this application can grow further. The team would also need to add native support for use of the website on mobile devices as it currently only supports desktop usage. The recommendation algorithm can also be improved by taking data provided by the user's cookies to give more accurate recommendations to users.

8. Project Management

Throughout this project, our team has adopted an agile project management approach, adhering to the principles behind the agile manifesto to welcome changing requirements and continuously deliver valuable software.

The specific agile methodology that we picked was Kanban. Kanban is a popular framework for agile software development, originally developed by Toyota in the late 1940s to optimize its engineering processes and to communicate capacity levels in real-time on the factory floor. For software development teams today, the same just-in-time (JIT) principles are leveraged by matching the amount of work-in-progress (WIP) to the team's capacity, giving teams clearer focus, faster output, and more transparency throughout the development process.

The work of a Kanban team revolves around the use of a Kanban board, which in this case is our version of a product backlog, a tool used to visualize and optimize the flow of work within the team. A basic Kanban board contains a three-step work flow of To Do, In Progress, and Done. For our purposes we created a Kanban board using Jira as we believed it to be a good collaborative tool for everyone to see the work needed to be completed, we also added a new column called On Hold, while not an ideal state for work to be in it might be necessary down the line. Further expanding on the JIT principle of matching the amount of WIP to the team's capacity, the In Progress column of the board has been limited to maximum 3 jobs at a time, meaning no new jobs should be started until there is space in the In Progress column. This results in shortened time cycles, faster release of software and not leaving things half done.

The process of adding jobs to the board at the start involved taking requirements, user stories, and results from the focus group and questionnaire to define the key features of our application and to establish the vision of our app. After identifying the tasks we need

to do, we added the "Important" label to certain tasks we deemed mandatory, while tasks without the label are deemed non-compulsory and can be completed at a later date. More tasks were added to the board throughout the whole development cycle as we came up with more ideas and requirements that would make the user experience more enjoyable. Once the prototypes were created and the team had a visual idea on what to do,we transitioned into the programming stage, starting on important tasks such as "Front Page" and delivering them when they were finished.
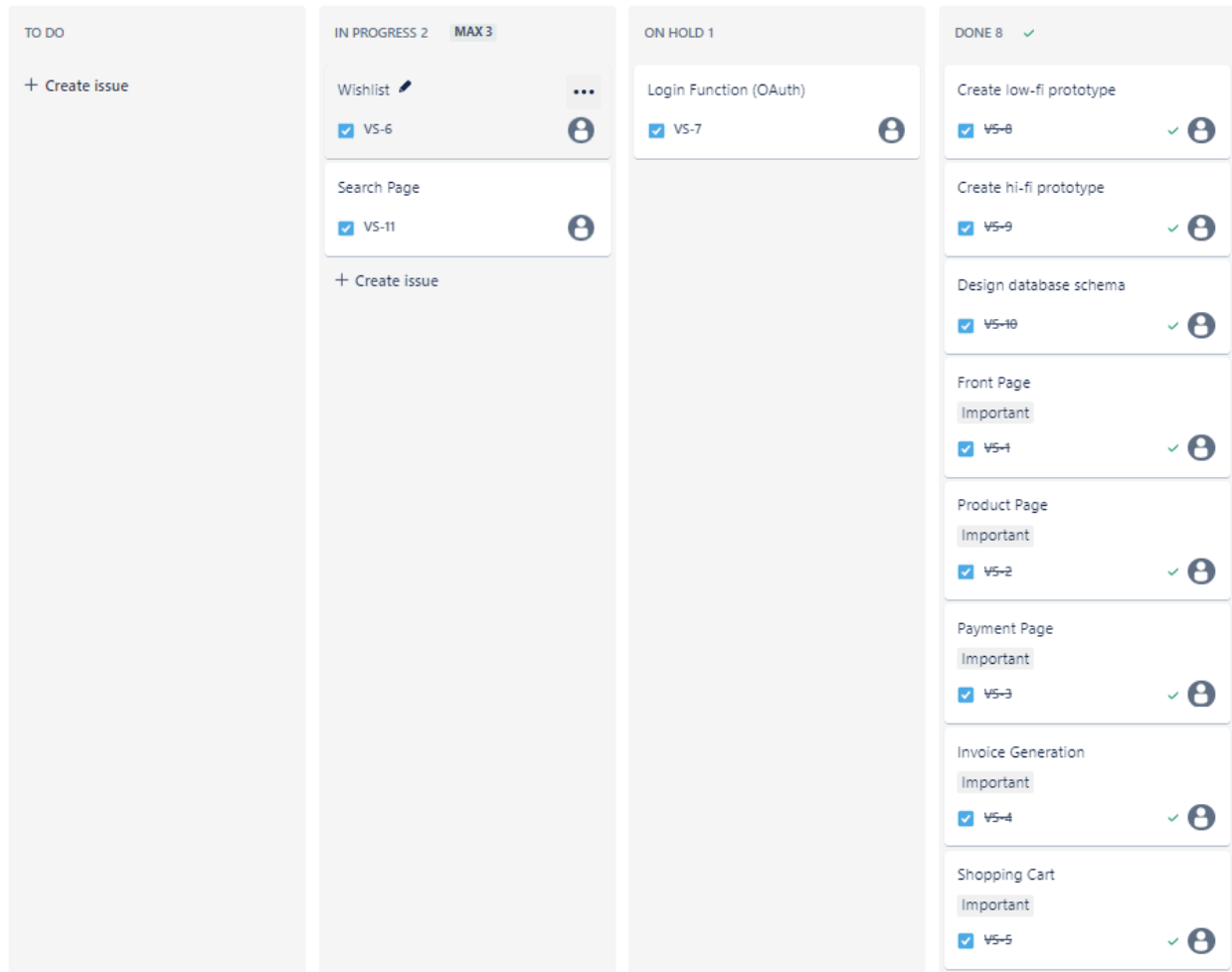
9. Appendix

Interview Questions

1) When was the last time you purchased volleyball equipment for your team/club?
2) How did you acquire those products? (Online or through connections)
3) How long did it take for you to receive those products?
4) Are you aware of the new VolleyStore since SportSet closed down?
5) If you are, why have you/haven't you bought your products from them?
6) From your experience, what products are the most sought after? Either buying it yourself or seeing other teams.
7) What challenges or frustrations have you experienced when shopping for volleyball equipment online?
8) What are some factors that could influence from what supplier you purchase from?
9) Do you prefer a clean and simple design or a more visually engaging website?
10) How important is detailed product information (size charts, materials, specifications) to you?
11) Are you more inclined to make a purchase during sales or promotions? Bulk buying discounts?
12) Have you ever had troubles with the finance side of purchasing products?

Questionnaire Questions

1) Do you consider it difficult to purchase volleyball gear for yourself within the UK?
2) How satisfied are you with the selection of volleyball gear online within the country?
3) How likely are you to purchase from an online store that provides more options and affordable pricing but at the expense of slightly longer shipping times?
4) From the factors listed below please pick the 2 most important factors you would consider when buying volleyball stuff online. (Price, Shipping Time, Reputation, Quality, Customer Service, Product Availability and Selection, Return Policy, Other)
5) When shopping for volleyball gear online, do you go in with something in mind, or more likely to look around and purchase what seems to be a good fit?
6) Are you more likely to buy products that are on sale/on promotion even if they aren't what you were originally shopping for?
7) What's your preferred method of payment when shopping online?
8) What additional features or services would you like to see in a new online volleyball shop? (Open-ended)

TO DO	IN PROGRESS 2 MAX 3	ON HOLD 1	DONE 8 ✓
+ Create issue	Wishlist ✏ ⋯	Login Function (OAuth)	Create low-fi prototype
	☑ VS-6	☑ VS-7	☑ ~~VS-8~~ ✓
	Search Page		Create hi-fi prototype
	☑ VS-11		☑ ~~VS-9~~ ✓
	+ Create issue		Design database schema
			☑ ~~VS-10~~ ✓
			Front Page
			Important
			☑ ~~VS-1~~ ✓
			Product Page
			Important
			☑ ~~VS-2~~ ✓
			Payment Page
			Important
			☑ ~~VS-3~~ ✓
			Invoice Generation
			Important
			☑ ~~VS-4~~ ✓
			Shopping Cart
			Important
			☑ ~~VS-5~~ ✓

Final Kanban Board

References

Belakhdar, R. (n.d.). *E-commerce UI - Figma Ecommerce UI Kit (Demo Version) | Figma Community*. [online] Figma. Available at: https://www.figma.com/community/file/1102233251923362930 [Accessed 11 Jan. 2024].

England, V. (n.d.). *VolleyStore*. [online] VolleyStore. Available at: https://volleystore.co.uk [Accessed 11 Jan. 2024].

Makarov, A. (2021). *Web Application Architecture: Types & Components*. [online] Azoft. Available at: https://www.azoft.com/blog/web-application-architecture/.

Radigan, D. (2022). *What is kanban?* [online] Atlassian. Available at: https://www.atlassian.com/agile/kanban.

Tornqvist, M. (2023). *The Importance of Requirements Gathering in Software Development*. [online] Medium. Available at: https://bootcamp.uxdesign.cc/the-importance-of-requirements-gathering-in-software-development-a8102b1f666e.