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# ITERATIVE DESIGN OF MOBILE GAME UX

Design defined by a target group

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<b>Abstract</b>		
<p>The objective of this thesis was to examine how utilising iterative design methods can improve the user experience and usability of a mobile game's interface. Further questions were how and when to implement user experience design and why it is important.</p> <p>The project part of this thesis contains (1) a survey, which was utilised as a starting point and an inspiration for the design process. A mobile game based on the analysed survey data was fabricated after which (2) a user interface was made utilising an iterative design approach. Iterations cycles consisted of making a wireframe, a prototype based on said wireframe, usability testing, analysing the findings from the usability test data after which the process started all over again. Three iterations were enough for this thesis to gain a satisfying end result.</p> <p>Qualitative research methods of iterative design were utilised in the project process as they were directly linked with the thesis topic.</p> <p>This thesis contains an introduction to the topic of user experience design, followed by the theory that is included within user-centered design approach, after which the project and its iterations are explained.</p> <p>The thesis objective was achieved, as iterating yielded results of improving the mobile game's interface in the terms of user experience and usability. The implementation of user experience design works best when included from the beginning of a project onwards and utilised in conjunction with iterative design. Involving users in the design process safeguards that their needs and expectations will be sated by the design.</p>		
<b>Keywords</b>		
user experience design, user centered design, wireframe, prototype, iterative design		

## CONTENTS

1	INTRODUCTION .....	5
2	USER-CENTERED DESIGN APPROACH .....	6
2.1	User experience.....	7
2.2	Usability & user testing .....	9
2.3	User experience design in mobile games .....	10
2.4	Iterative design .....	11
3	ITERATIVE DESIGN OF AN USER INTERFACE FOR A MOBILE GAME .....	12
3.1	The survey .....	12
3.2	First iteration .....	15
3.2.1	Wireframe .....	19
3.2.2	Prototype .....	20
3.2.3	User testing.....	20
3.2.4	Analysis .....	21
3.3	Second iteration.....	23
3.3.1	Wireframe improvements.....	23
3.3.2	Prototype updates.....	27
3.3.3	User testing.....	30
3.3.4	Analysis .....	31
3.4	Final iteration .....	33
3.4.1	Wireframe improvements.....	33
3.4.2	Prototype updates.....	36
4	CONCLUSION.....	36
	REFERENCES .....	39

LIST OF FIGURES

APPENDICES





## 1 INTRODUCTION

What keeps a player returning to a game over and over again, is it the mechanics, the story or something else completely? The reason is different for each individual, but they all relate to one interconnecting element, the experience. Conveying a satisfying experience for the player is crucial, as it does not only limit to the gameplay. User experience begins the moment a potential user decides to pay their attention to a game and it ranges throughout the process of opening the game, navigating the interface, playing and finally closing the game. Without this, it is highly likely that the player will move on to the next game that can provide a better experience.

The goal of this thesis was to examine how utilising iterative design methods can improve the user experience and usability of a mobile game's interface. To achieve this, a working prototype of a user interface for a mobile game through the perspective of user experience design was made. The progress had an initial research phase, where a survey was conducted as a tool, inspiration and a starting point for the design process. In the second phase, the findings from the survey were utilised in fabricating a game for which the user interface was produced. The interface was designed iteratively in three cycles, as that amount would yield enough data to produce an end result satisfying enough for this study.

The theory part of this thesis will cover the user-centered approach to design which includes, but is not limited to, user experience design, user-centered design, iterative design and usability testing. The project part of this thesis was made in order to study the application of user experience design on a mobile game and learn how to implement it, when to use it and why it is important. Qualitative research methods of iterative design were utilised in the project process as they were directly linked with the theory (Zimmerman 2003).

User experience, UX for short, refers to experiences derived from encountering systems and these encounters have a beginning and an end. Iterative design approach focuses the design process to be done in multiple rapid cycles, unlike

for example the waterfall model (Royce 1970). User-centered design methodologies are utilised in order to satiate the needs and expectations of the users utilising the design.

## **2 USER-CENTERED DESIGN APPROACH**

User-centered design is a design philosophy that incorporates methods which focus on the involvement of the users in various stages of the design process. Understanding human needs, capabilities and behaviour is at the core of user-centered design as through these aspects the design can accommodate the needs of the users, even if they themselves do not always recognize the true needs. Areas of focus, such as user experience design, can be applied with user-centered design philosophy in order to direct the process into creating a user friendly end results (Abrás et al. 2004; Norman 2013).

The goal of user-centered design is for the designer to facilitate any given task for the users in a manner that the product at hand could be used as intended and learning how to use it could be done with minimum effort. These can be achieved by (1) making the design clear in the manner that it is easy to determine available actions in the product, (2) what those actions and their results do, (3) ease of evaluating the system's current state and (4) by following the natural route of causality. According to Norman (1988), there are seven principles of design that are essential for making the design process easier for the designer: (1) Before implementing a design, write down the conceptual models in easily understood manuals, (2) take into consideration the long and short term memory of the user by simplification of the design, (3) make the design obvious for the user in order to connect the expectation with the intended result, (4) use graphics to illustrate the idea, (5) make sure the user always feels that there is at least one thing to do, (6) do not focus on a perfect design, make sure there are user friendly ways to troubleshoot when problems occur and (7) unify the design if all else fails.

User-centered design does not guarantee a perfect end result. Involving the users in the design process can make the product satiate the user's needs more effectively and efficiently but at the same time this might raise the projects

expenses and take longer period of time to produce. Depending on the nature and needs of a project, users could be involved on a more surface level, for example only at the times of usability testing, or in a deeper level, as in being closely involved throughout the design process (Abrams et al. 2004; Norman 2013).

## **2.1 User experience**

Origins of the term user experience date far beyond the conception of its name. People have utilised basic principles of user experience throughout the history, but it has emerged more prevalent within the last 100 years. For example, in the early 20th century Frederick Winslow Taylor researched the relation between the worker and their tools, in the 1940s Toyota developed a production system that was more human-centered and in 1966 Walt Disney, who is considered being one of the earliest UX designers, emphasized customers enjoyment as top priority in the making of the Disney World (Dickerson 2013; Lyonnais 2017).

The rise of personal computers from the 1970s onwards cued a major need of better usability for the users and during the 1990s a cognitive scientist named Don Norman was the first one to use the term user experience in a job title. Don Norman stated on the term user experience design. "I invented the term because I thought human interface and usability were too narrow: I wanted to cover all aspects of the person's experience with a system, including industrial design, graphics, the interface, the physical interaction, and the manual." (Stevens 2018.)

User experience and experience have different definitions. According to User Experience White Paper (2011) an experience and the verb of it, experiencing, refer to an individual's perceptions and interpretations of said perceptions. User experience, also known as UX, differs in the general sense that it explicitly refers to experiences derived from encountering systems and these encounters have a beginning and an end. As a broad concept, some experts in the field have argued that user experience itself is only a part of customer experience, which is described as the user's progress from gaining knowledge of a product to the testing of said product and possibly giving feedback (Cao 2016).

The term user experience design, shortened into UXD, has often been utilised as an umbrella term for multiple areas that involve user experience. As such, understanding of the term UX widely differs from person to person (UserTesting 2018). User experience can be observed from different perspectives. For example as a phenomenon user experience focuses more into the experiences with encountering systems, be it on a personal level or passively observing others utilising systems. Each encounter and experience is unique to the individual, but at the same time they are influenced by prior experiences or expectations. As a practice, user experience design centralizes the user in top priority, researching and discerning key aspects of the design for the target group of the project, involves the users in participating by testing sessions and iteratively developing the process further.

Another way of describing user experience is by what it is not. A general misconception of user experience design is that it means the same as user interface, visual design, usability testing or user-centered design. The foregoing examples were but a few and many more exist. User experience design is inherently tied into user-centered design and interaction design, as they encompass each other in the manner that the user and their needs are positioned in the center of the design process. (User Experience White Paper 2011; Flowers 2012.)

As the definition for user experience design is complex to pinpoint, it has been often misunderstood as another way of discussing the area of user interface design. These two design areas do overlap for the most part, but in essence they differ greatly. User interface design is not innately user centered design and its focus is more on the surface level visuals and functions in specific areas at a time. User experience design always prioritizes the user and their journey of experiences on the product as a whole. (Flowers 2012; Hughes 2010; UserTesting 2018; UX Design No date; Ditmeyer 2018.)

## 2.2 Usability & user testing

Usability can be defined in multiple ways, two most common definitions are by Nielsen (2012) and ISO 9241-11 (2018). According to Nielsen's (2012) definition of usability, it is a quality attribute that can be applied during the design process in order to evaluate the easy-of-use of the interface. Five components can be pointed out from usability in order to define it: (1) Learnability, how easy it is for a first time user to execute a basic task; (2) efficiency, the speed of executing tasks after learning the design; (3) memorability, how well proficiency can be re-achieved after a period of not using the design; (4) errors, troubleshoot assessing as in monitoring the amount and severity of errors made by the users and their recovery from said errors; (5) Satisfaction, how well does the design appeal. Nielsen adds that utility, the design's functionality, should not be neglected as the design would not be useful if either the required features or usability are missing. ISO 9241-11 (2018) is a set of usability standards and definitions aimed for usability professionals, designers and developers of systems, quality assurance personnel, public purchasers and consumer organizations. As stated in the ISO 9245-11, usability is the "extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use".

Usability testing is often utilised in iterative design and its main goal is to ensure that the usability of the design improves by each iteration. This can be achieved by (1) involving actual users in the testing process, (2) giving them proper tasks to execute, (3) letting the designer observe and record the users testing the product and (4) afterwards analyse the gathered data. Changes to the design would be made according to the analysis findings (Abrams et al. 2004).

Usability test should not be mistaken for focus groups, as the latter is good for figuring out if the design makes sense and has a good value proposition. To figure out if the design works in practice, usability testing is a necessary action. For an iteratively progressing design to succeed, usability testing is vital as it will indisputably expose errors that are easily missed by the designer. According to Krug (2006), even a singular tester is invaluable and it does not matter if they are

not exactly the intended user of the design being tested. As the quantity of the testers is not a concern to focus on, the amount of tests conducted is. Multiple, smaller tests can unravel more problems in the design than a single, big one. One of the major merits for the designer on utilising usability tests is to gain confidence in choosing which way to take the process, as it cannot give straight up answers but only insight to what might be the proper course of action. Properly observed tests will yield more than enough data even with three to four testers.

### **2.3 User experience design in mobile games**

On mobile games the user experience design is utilised in highly similar manner to designing mobile websites, although in the case of games the main aspect of focus is to deliver the fun factor, the game, to the users without hindrances. Deciding the platform on which the game would be developed to is a crucial decision, as focusing only on a single platform or developing on multiple platforms both bring their own unique problems. Choosing on the two dominant operating systems on mobile, android and iOS, is not the only thing to take into consideration in the design process. In the terms of optimization, the size of the mobile device and language options have to be taken into account. Mobile devices, phones and tablets, vary in size drastically even within their own device category. Localization might bring the problem of fitting the text areas in the game with all languages while keeping in mind how some languages are written and read.

As with other aspects of making a game, user experience design also greatly benefits from having style guides. The design has to be cohesive and consistent not only for the user to understand it, but for the whole design team to be able to have a common understanding of it. This for example eases the recruitment of new designers at any given point of the process. Whatever game is being developed, it is aimed for the target audience, not the designers themselves and as such researching the target audience and conducting usability tests is mandatory, as understanding the players often will reveal matters that the designers took for granted.

One of the main issues to be tackled in mobile user experience is the available space for the features. Only the necessary information should be displayed at any given screen and accessibility to content should not be hindered by arbitrary walls, such as a message diverting the player to somewhere else from the core loop. These can easily be the downfall of a game or an app if the user gets frustrated and is not given an incentive to move onwards. (Wilson 2018; Tandon 2018; Designing UX in World of Tanks Blitz: What got us to Best Appstore Game 2014.)

## **2.4 Iterative design**

Iterative design is a process-based design methodology and a form of design research. Instead of making everything in a project in a single segment, the design is divided into smaller portions and these are put through multiple loops of testing, analyzing data and making improvements based on the analysis. This is called iterating. Predicting every possible outcome of actions made by the users is impossible and as such, in the terms of time and resource management, it is better to let users test the design throughout various stages of the process. This will help on surfacing underlying problems that the designers are not usually trying to answer initially. (Zimmerman 2003.)

Wireframing, functional prototypes and mockups are tools for iterative design process. However, they are easily mistaken as being one and the same.

Description of their difference would be the following: (1) Wireframe is low fidelity in the terms of graphics, non-interactable and focuses on the functionality of the design; (2) prototype can be either low or high fidelity in the terms of graphics but main difference to wireframes and mockups is that it can be interacted with; (3) mockup is a high fidelity presentation of the design, but non-interactable (MockingBot 2016; Yu et al. 2018).

Prototyping can be described as taking a sample of the design, testing it, gathering feedback and experimenting on it with new ideas. As previously mentioned, the point of iterative design is to be time and resource efficient and as

such prototyping also needs to follow suit. Prototyping can be done through multitude of mediums, be it traditional or digital. Sketching in the traditional way with pen and paper is often utilised in the very early stages of any iteration, as it is the most accessible medium. Digital prototyping tools can vary drastically, be it pricing and licenses, available tools within the program, availability on a platform or functionality.

### **3 ITERATIVE DESIGN OF AN USER INTERFACE FOR A MOBILE GAME**

The aim of the project was to design a user interface for a mobile game for a midcore player audience, main focus being on the user experience and utilizing user centered design methods to make it. This was done in order to find out what needs to be taken into account when designing a user interface for the target audience mentioned before. The project was made in the following segments: (1) Studying existing surveys and choosing a suitable one to be utilized for data gathering; (2) analyzing data from users; (3) further defining the target audience and genre of a mobile game based on the user data; (4) writing down and illustrating an initial task flow for the user interface; (5) and then proceeding to an iterative design of wireframes and prototypes.

A survey was used to gather vital information from the users to define genres and mechanics suitable for the target audience that could be utilized in the design process. The scope of the design phase was limited to three iterations. Each iteration was segmented into four stages that are wireframing, prototyping, user testing and analysing user feedback. The final iteration does not include a user testing and an analysis after which the project is considered to be complete. Wireframing was mainly done in Adobe illustrator, as it provided an easy platform to quickly test out ideas. Prototypes that could actually work on mobile devices were made using Adobe XD.

#### **3.1 The survey**

The survey was utilised in this project as a tool, being aimed for a midcore audience in mobile gaming with the goal of mapping out player preferences.



Through these preferences, the genre and core gameplay elements would be fabricated for further use in the project. The survey used the theory of Gamer Motivation Profiles available at The Quantic Foundry that is a market research company focusing on gamer research (The Quantic Foundry 2019).

The definition of midcore audience is vague and widely debated. Often the users are thrown into a rough spectrum from hardcore to casual and midcore is utilised as an additional ladder in the user segmentation. One way to define these segments would be through the lens of time usage; (1) casual player may play short intervals of a few minutes of a game when such time presents itself during the day; (2) midcore player arranges time for playing from their respective daily schedule and a session might range from a few minutes to over 30 minutes; (3) Hardcore player arranges their daily schedule around playing and a session usually ranges for multiple hours at a time. These definitions however are also context dependent, for example someone who is a devout hardcore gamer might embody aspects of casual gamer when they are waiting for a bus and decide to play a mobile game for a minute or two. This would be a case where the user is within two player types and shows that the categorization is not all-encompassing and absolute. (Graft 2013.)

The Quantic Foundry's Gamer Motivation Profile is based on using psychology research method of factor analysis (see Gorsuch 1983) on survey data. Their survey was based on existing literature on player motivations and models of fun. Quantic Foundry made an initial survey of 50 questions that would be tested on approximately 600 participants. Through that data, they iteratively improved the survey until they came up with a model good enough to be launched on a web platform. Players utilising the new survey would get a personalised motivation profile relative to the players in the initial survey sample. New instances of data were ran through factor analysis to further improve the survey, meaning that items in it would be replaced or removed completely. From the improved survey data, a model of 12 unique motivations emerged (Figure 1 quantic foundry model overview).

## GAMER MOTIVATION MODEL



					
Action "Boom!"	Social "Let's Play Together"	Mastery "Let Me Think"	Achievement "I Want More"	Immersion "Once Upon a Time"	Creativity "What If?"
<b>Destruction</b> Guns. Explosives. Chaos. Mayhem.	<b>Competition</b> Duels. Matches. High on Ranking.	<b>Challenge</b> Practice. High Difficulty. Challenges.	<b>Completion</b> Get All Collectibles. Complete All Missions.	<b>Fantasy</b> Being someone else, somewhere else.	<b>Design</b> Expression. Customization.
<b>Excitement</b> Fast-Paced. Action. Surprises. Thrills.	<b>Community</b> Being on Team. Chatting. Interacting.	<b>Strategy</b> Thinking Ahead. Making Decisions.	<b>Power</b> Powerful Character. Powerful Equipment.	<b>Story</b> Elaborate plots. Interesting characters.	<b>Discovery</b> Explore. Tinker. Experiment.

Figure 1. Gamer Motivation Model (Quantic Foundry 2019).

These motivations were clustered into six pairs. On a high level, from these six pairs would form three bigger clusters; (1) action-social, (2) mastery-achievement and (3) immersion-creativity. The Big Five personality traits (Goldberg 1990) were utilised as a lens to gain understanding why these motivations clustered and how they align with the personality traits. (The Gamer Motivation Profile: Model and Findings.)

The idea of the survey was to act as a design inspiration and starting point for the design process. A message was posted in a social channel containing a link to the survey, asking for people to fill in the survey from the perspective of their mobile gaming, if they consider themselves to be part of a midcore audience. A brief explanation of the thesis topic, midcore audience and further guidelines from which perspective the survey would be filled in were given in the message. The results would be utilised anonymously. As mentioned in the post, the author of the thesis does not own the survey, the website or anything associated with it. This meant that there was no way of accessing the survey data, other than the people sending their result directly to the author. In total five people replied and from them, three participants could not be confirmed if they were midcore mobile gamers. The small amount of data that was gathered had to be relied on being

accurate. According to Saffer (2007), a project's user testing does not necessary require a vast quantity of users as even a single user can be sufficient.

The results from the five participants were analysed by making a visual representation where the data was stacked and observed for clusters in different motivations (Figure 2). Visualization of research data is often utilised as a tool to make the findings more easily understood (Saffer 2007, 91). These motivation clusters would be utilised as an additional tool in defining the genre and core gameplay elements of a game.

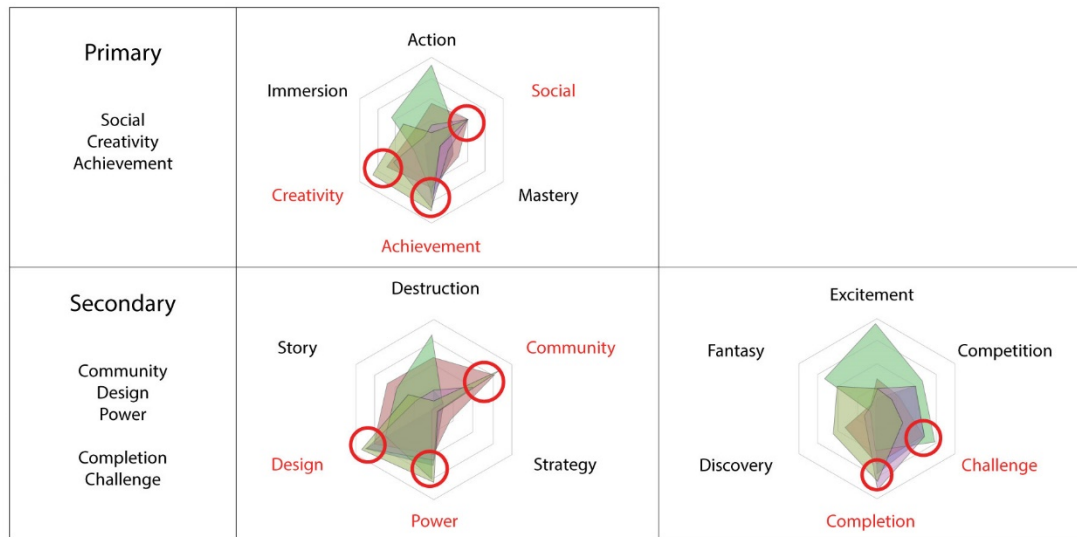


Figure 2. Combined survey data. The diagram is based on the theory by Quantic Foundry (2019).

Main motivations that were discovered from the data were related to socializing, creativity and achievements. Underlying these three were community, design, power and completion. Challenge was not directly connected to the main motivations, but it still had significant presence in the results.

### 3.2 First iteration

Having done the data gathering and analyzing it, the next step was to fabricate a game. Utilizing the findings from said data, the game was defined as a puzzle orientated time killer with the main hook being collectibles and customization. Theme of the game was derived from hobbies that utilize a multitude of

equipment and the most prominent candidate for the purpose of this project was catch and release fishing.

As the focus of this project is mainly about UX, the finer details of actual gameplay will not be expanded upon. Design of the layout was to be as user friendly as possible while fulfilling the expected requirements of the genre. Taking into account the main target audience, depth of complexity and clarity were major elements to be addressed.

In order to keep the scope of this project within reasonable time limits, the number of customization and collectible options were kept to a relatively low amount in the prototype. Before wireframing, a task flow chart and a site map were made to keep track of what is needed to be made, how the required menu elements are supposed to be navigated and why the layout is designed that way, as seen in figure 3 and figure 4.

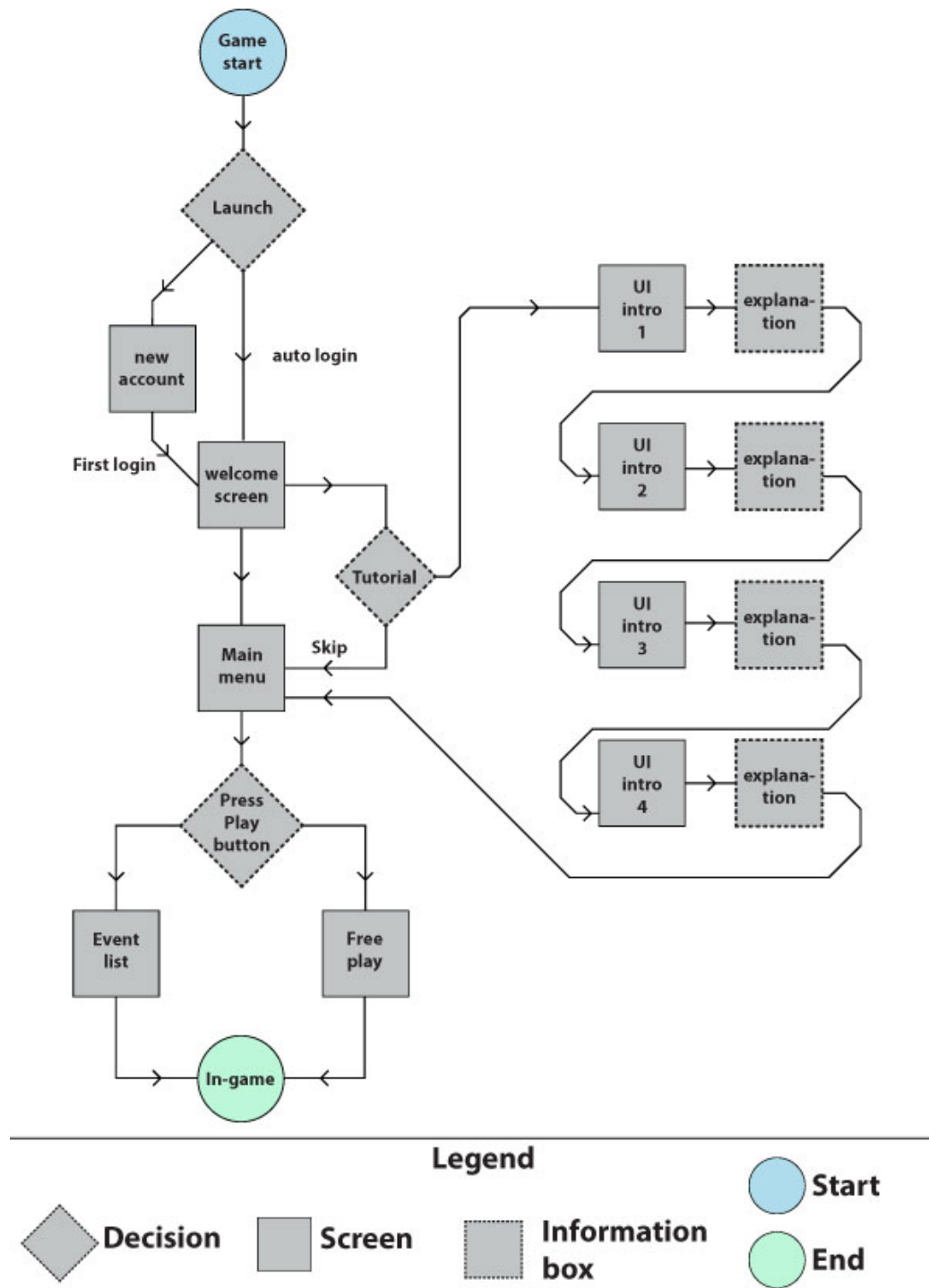


Figure 3. Task flow chart.

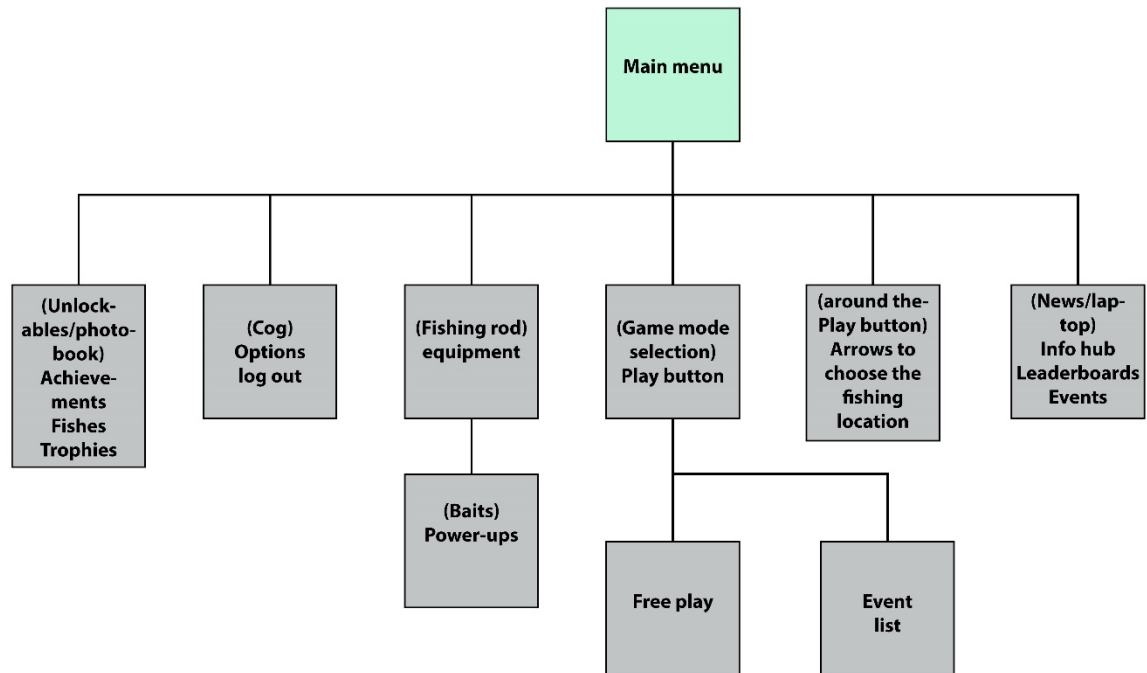


Figure 4. Site map.

As mentioned by Saffer (2007, 105) task flows are utilised in putting established tasks of the project into a sensible order and showcasing logic connections within the wireframes. This can help the designer in visualizing the shape of the project. Task flows incorporate a defined starting and ending point. According to Brown (2011), a site map is a tool that can be utilised in visualizing the structure of a project and ensuring that the content is where the users expect to find it. The visualization is done through grouping of related content.

In terms of customization, fishing provides multiple options for gameplay affecting unlockables such as fishing rods, baits and boats. In addition, there are several collectibles that do not affect gameplay such as fishes, trophies from contests and achievements for various feats to be done in free play or in events.

The game starts from the game’s launch on a mobile device (Figure 3) and then checks if the player is logging in for the first time or not. From there the player is directed to a welcome screen from where the user can either go straight to the main menu or into a string of tutorials which eventually lead up in the main menu as well. In the main menu the player can access various sub-menus.

### 3.2.1 Wireframe

Professionally made user interfaces were examined and analyzed to compensate the lack of knowledge (see Young 2015; Dawson 2017). Sim Young's mobile game wireframe (Young 2015) included a user flow chart that heavily influenced the initial stages of this project. There can only be so much that fits into a mobile device's screen at a time while being reasonably sized. The elements should be named as self-evident as possible to have a higher probability to correspond a user's assumed mental model of a menu. The progress began with making the barebones of the menus and continue expanding from there (Figure 5).

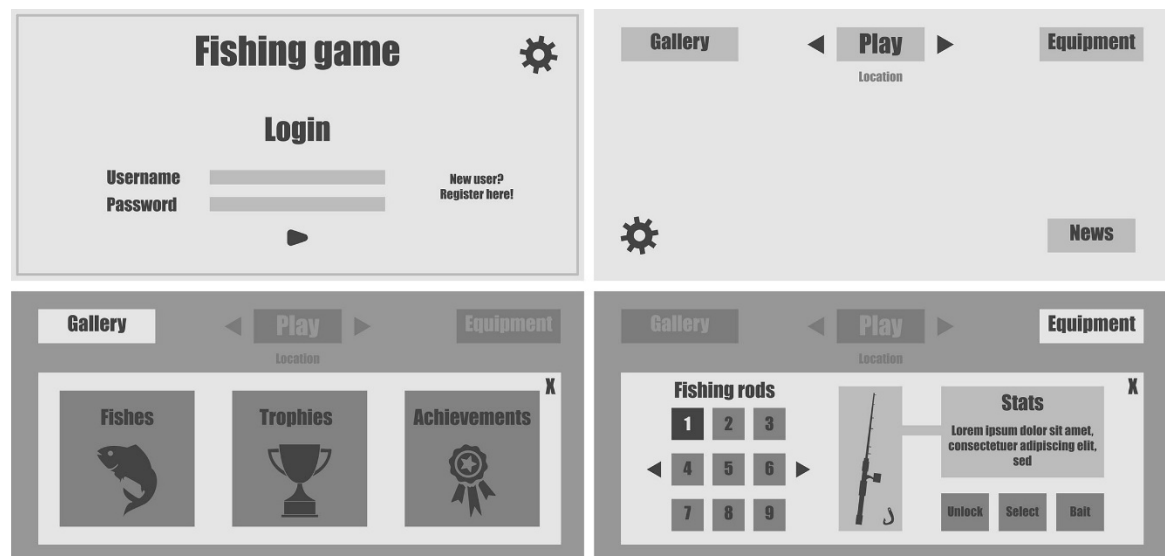


Figure 5. Examples of the first wireframe.

The first iteration round included the most essential functionality that could be extended after the first usability test (Appendix 1). As seen in Figure 5 the intended main elements for the user would be play, gallery and equipment. Play would take the player into the game, the role of gallery is to house and display all possible collectibles in the game and equipment is for storing and equipping items that convey the element of power. Secondary elements would be the news and options, as they inherently do not correspond to the games genre.

### **3.2.2 Prototype**

Digital form was chosen for its ease of modification by the author and the testers could get a better grasp on how the end result would look and feel like on an actual device. The chosen program for this project was Adobe XD. It is made for fast prototype iterations and provides the possibility of seeing the end results immediately on a mobile device. Downside to this live view feature is that it is supported only on a Mac computer, not on Windows platform. The author was not in possession of a Mac platform, thus the prototype had to be first uploaded into Adobe's Creative Cloud service and then with a mobile device download it from there.

The Adobe XD is still in development, meaning that in the terms of features it is not on par with the rest of the Adobe catalogue. This meant that everything that the author would have wanted to implement did not have a reasonable way to make them, or it would have taken an excessive amount of time to figure out all possible outcomes that a user might take while navigating the prototype. Almost all types of features in the prototype were given at least one instance to showcase how it would operate in a final product, but not all variations were made available.

Transition from the wireframe to the prototype was simple as both programs used were from Adobe and moving objects from one to another was seamless. Near the end of the first prototype process it was made clear that there was room for improvement in the step of moving elements from illustrator to XD. To streamline and speed up the progress, slight changes had to be made into the layering of objects before they were moved into XD. This change was implemented from the second wireframe onwards, as the first version was almost complete at this point.

### **3.2.3 User testing**

The testing was conducted with one person at a time so that the users would not need to wait for a turn to ask additional information. The feedback from these



testing sessions were gathered anonymously. According to Krug (2006, 138) a small group of testers, three to four persons, is enough to discover majority of the usability problems and the amount of notes gathered from the testing sessions are enough to be processed within the same day. A total of seven people tested and gave feedback of the first prototype.

The testers were given an introduction to this thesis and the project part, after which they were handed a mobile phone with a working version of the prototype and a notebook to write down the feedback. Brief guidelines were given to the testers, for example what felt natural, did the design correspond to the assumptions of the user, what should be changed, added or completely discarded. The limitations of the Adobe XD program were also mentioned to the testers in order to prevent unnecessary frustration or confusion.

As this was the first iteration, no hard time limit was given to the testers. This was done so that an approximate limit could present itself by the testers. Some tests were faster than others, but in the end the testers took somewhere between 15 to 45 minutes to feel like they have nothing more to contribute to the feedback.

### **3.2.4 Analysis**

The first prototype was met with generally positive and constructive feedback. The intentioned way of utilising the interface was on point for the most part. Some missing features were pointed out but majority of criticism landed on the naming of various sub-menus that were not consistent. The complexity of the user interface was appropriate, according to the testers.

In the main menu, the button placement was working as intended with the exception of options (Figure 6), according to one tester. Suggested action was to move it to the other corner and add options to login screen to maintain consistency. This went well with another suggested action by two testers, merging options with the news sub-menu (Figure 7). The result of merging options and news as they were would have been a cluttered sub-menu and at least one element within these sub-menus had to be moved somewhere else or

outright removed. Moving leaderboards from news to gallery as its own sub-menu was a logical choice.

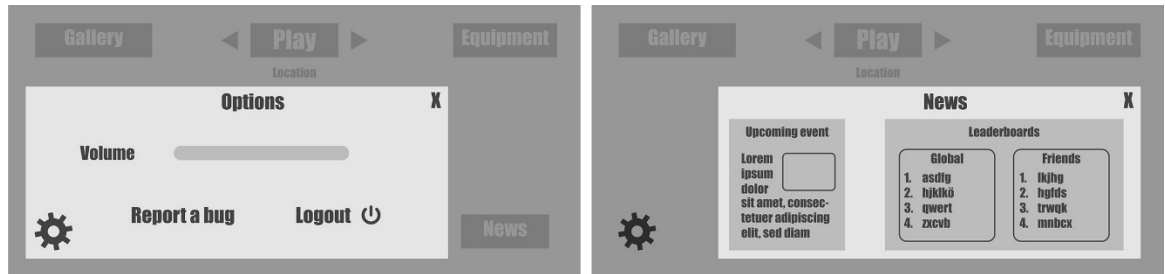


Figure 6. Options and news in the first iteration.

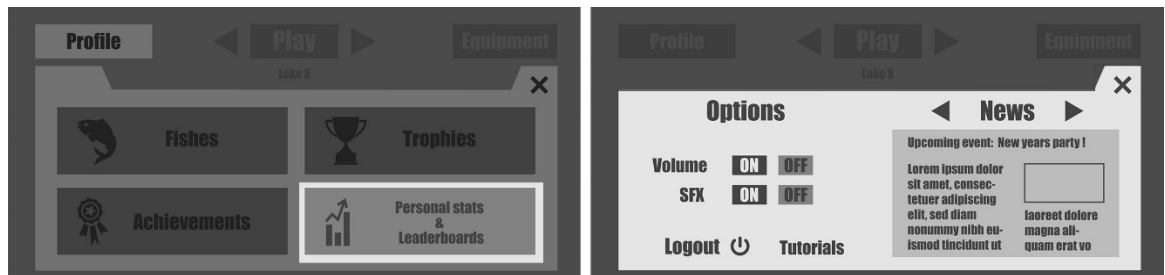


Figure 7. Options and news in the second iteration.

In options, the design choices for affecting volume and sound effects were not satisfying according to most testers. Simple on and off buttons would better fulfil the needs of this game's options menu. The lack of easy and fast access back to the tutorials was pointed out by a few of the testers, the natural choice for placing it would be within options.

The gallery was commented on being slightly misleading with its name. The most suitable suggestion for an alternative name was profile. A slight change in the gallery's design had to be done in order for a button leading to the leaderboard sub-menu to fit in. Lack of unity in design within the gallery's sub-menus was mentioned by multiple testers. The design choices made in trophies were commented on working the best. The leaderboards was criticized for its lack of the users ranking.

### **3.3 Second iteration**

The second cycle was initiated immediately after the analysis of the first iteration was processed. Viable information was gained on the course of actions that should be changed in the process itself. Further accustomization to the workflow of this project meant that more could be achieved in shorter intervals.

#### **3.3.1 Wireframe improvements**

The changes made in the second cycle were based on the analysed user testing data. The updating process advanced in the following order, login screen, welcome screen, main menu, tutorials for the main menu, profile, equipment and options. This route of working on the different areas of the iteration did not bring any additional hindrances.

As can be seen in Figure 8, the only change made in login screen was the addition of options and news icon to the bottom right corner, where it would be on the same placement as in the main menu. In the welcome screen, a tutorial button was added and located in the bottom middle of the screen. The previous version's skip button in the welcome screen was renamed to main menu. The main menu mostly had minor changes, adjusting the placement of button texts and the singular major change was the deletion of news tab and switching options to the right side of the screen.

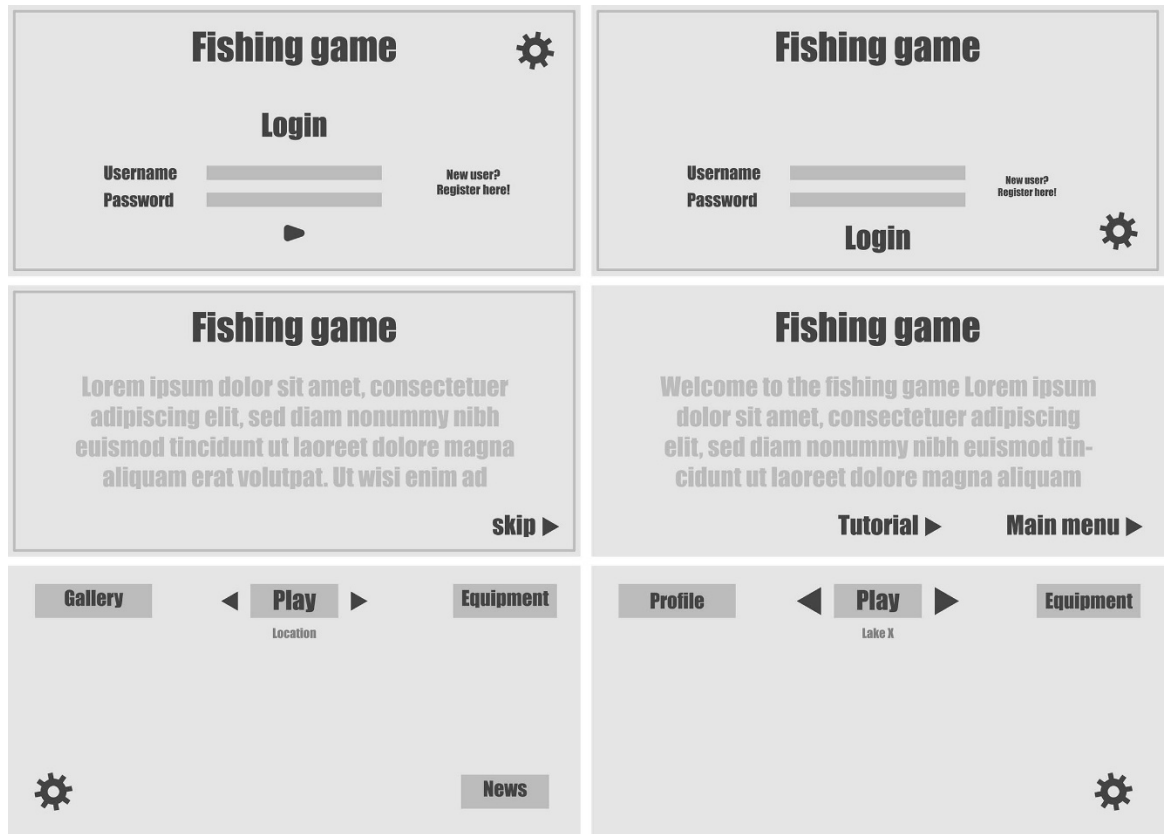


Figure 8. Iteration one (left) and two (right) comparison on login, welcome and main menu screens

The gallery was renamed into profile (Figure 9), the button sizes and placement were adjusted as the leaderboards was added to the sub-menu. The additional button made the sub-menu feel too tightly packed, which lead to testing to slightly upscale the background box. This adjustment gave more breathing room for the design. The X button and back button were also adjusted into bigger size to feel more responsive in the prototype.

At this point in the process, a decision was made that the changes in the profile sub-menu's background were to be added to majority of other sub-menu backgrounds. This was done in order that any design changes made later in the line could fit properly without the need for time consuming adjustments each time a problem would occur. After the background was re-sized, another problem arose. There was too much empty space in the background box and top side of it would hide the currently selected area in the dimmed main menu background. A simple solution was applied, an inset was placed on the top side of the

background box. Simultaneously, this made fitting placements for the back and X buttons while cutting the excess empty area (Figure 9; appendix 2/7 — 2/8).

Previously the design between fishes, achievements and trophies was not unified. As in the analysis (see section 3.2.4), the design of trophies sub-menu was the most favourable. The flow of how the profile sub-menus works was slightly altered to better suit the upcoming changes.

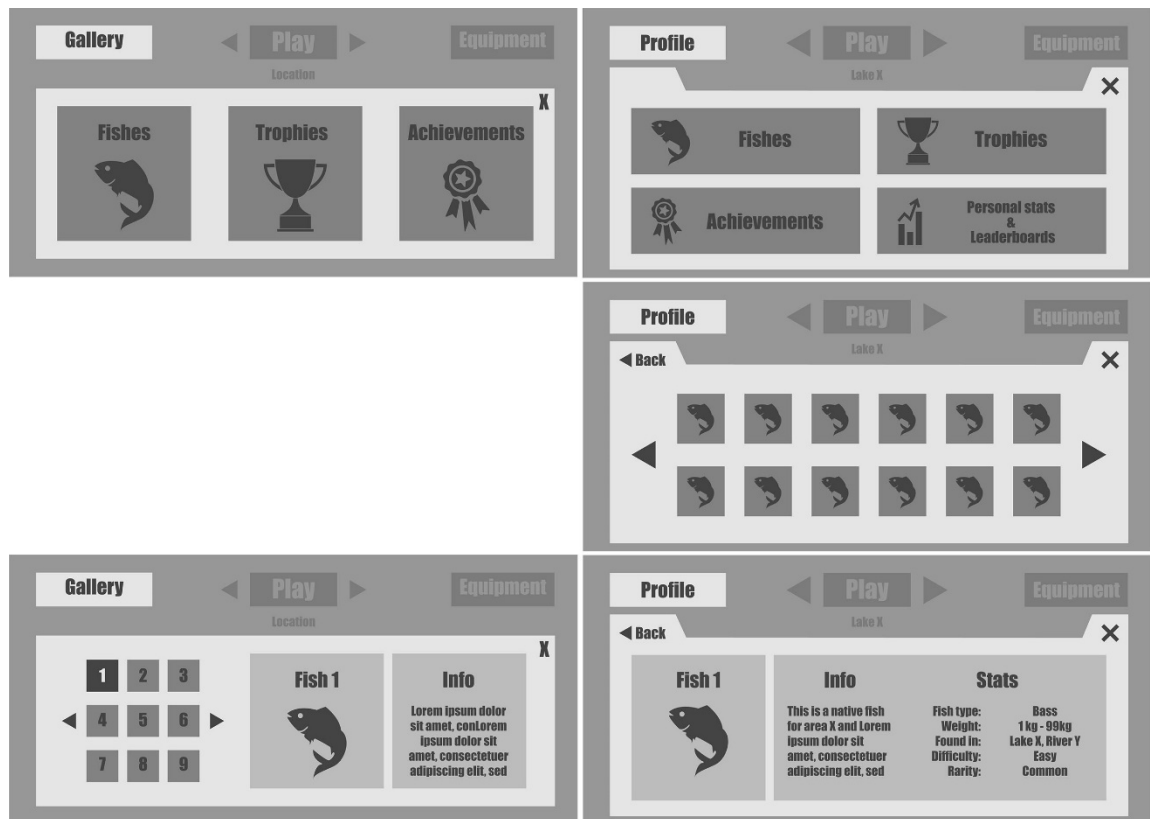


Figure 9. First iteration gallery compared to the second iteration profile.

In the first iteration, after entering a sub-menu the stats would be seen adjacent to the button grid and when one option was chosen it would be highlighted. In the second iteration, entering a sub-menu would open a two by six grid where the different options would lead to a separate stat screen. The change made compilation of the prototype in Adobe XD faster, this will be opened more in the prototype update chapter.

The new version of showing collectibles was made into two consecutive sub-menus. First, the player would choose a collectible and second, tapping it would

show its stats. The buttons were kept in the size they were in the original trophies sub-menu. Now they were arranged into a grid of two by six and navigation arrows were added to the sides to indicate the possibility of expanding the amount of collectibles as adjacent, scrolling pages. The stats page was made by placing the collectibles icon on the left side and expanding the information text box from its original place until it reached the icon (Figure 9). Now the stats of the collectible are displayed next to a small flavour text.

The new sub-menu design made in trophies was applied to fishes and achievements, with slight alteration done in achievements since it would not require as specific stats than the other two sub-menus. The leaderboards was given a different design. The author's testing proved that the functionality of the sub-menu would not work if both user's stats and leaderboards were in the same place. The name of the sub-menu was changed into personal stats and leaderboards and they would be separate options, this was made in order for a more logical placement of the user information. Personal stats would keep track of most things the player does, while leaderboards would be about tracking the high scores of all players (Figure 10).

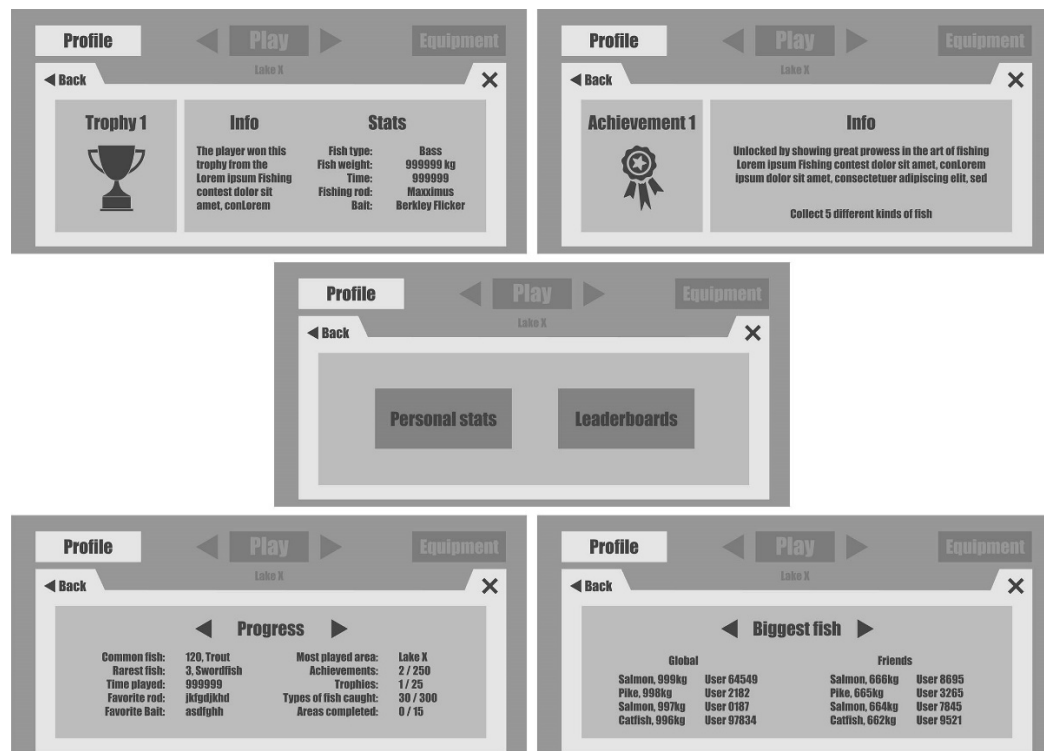


Figure 10. Improvements made in iteration two.

The tutorials were given a similar, smaller, background box as the profile sub-menus (Figure 11). Naming of the tutorials were adjusted to correctly correspond to the other changes made in the second iteration. The Back button was added for additional navigation. In the equipment, a slight redesign was tested to see if the unified button grid system from the profile would work in this sub-menu. The old three by three grid proved to work better and no further changes were made.

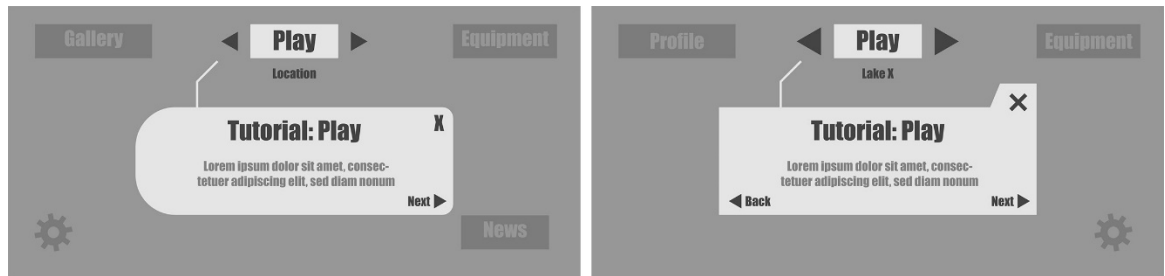


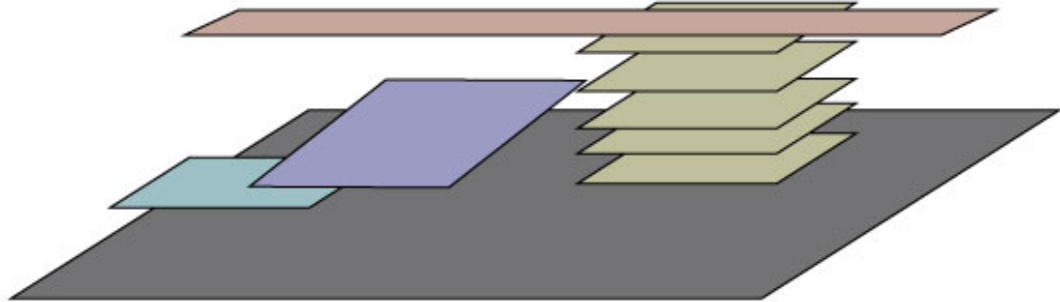
Figure 11. Tutorial comparison between iteration one and two.

The options were designed to house both settings related elements and news. The setting options were located in the left half. Volume and effects sliders were changed into simple on and off buttons, logout and tutorials located underneath them. The news tab was designed to show one small article at a time and it could be changed with navigation arrows above the article.

### 3.3.2 Prototype updates

The process of second prototype did not introduce many changes into the workflow. During the late stages of the first iteration, a better way of layering elements was discovered. Separating the elements in three distinct layers meant that if any problems occur later during the process, they could be easily addressed with. The top layer would consist of the elements that are important, such as text and buttons. Middle layer houses background elements for the texts and buttons. The bottom layer is the base for the previous two layers and would consist mainly of a background image (Figure 12). For example, the login screen, welcome screen and main menu have only bottom and top layers. All the sub-menus are made in three layers.

# Old layering



---

# New layering

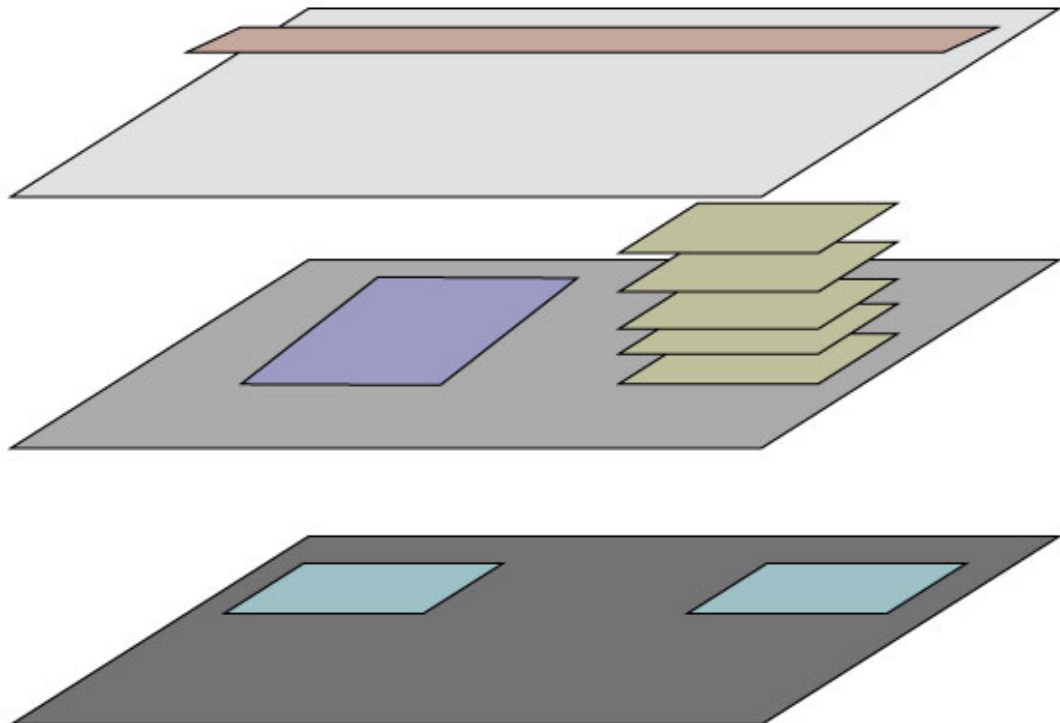


Figure 12. Example of the layering methods.

When a defect was found in any of the three layers, the layer was fixed in Adobe Illustrator, then copied back to Adobe XD and set in its respective place in the



hierarchy. If other artboards were affected by the same defect, then the solution was applied to them as well.

The first iteration prototype utilised a unified system when it came to navigating within the fish, trophy, achievement and equipment submenus. As seen in the figure 13, having this kind of grid button system made in Adobe XD meant that every possible action that could be taken from the starting state, would need to be taken into account.

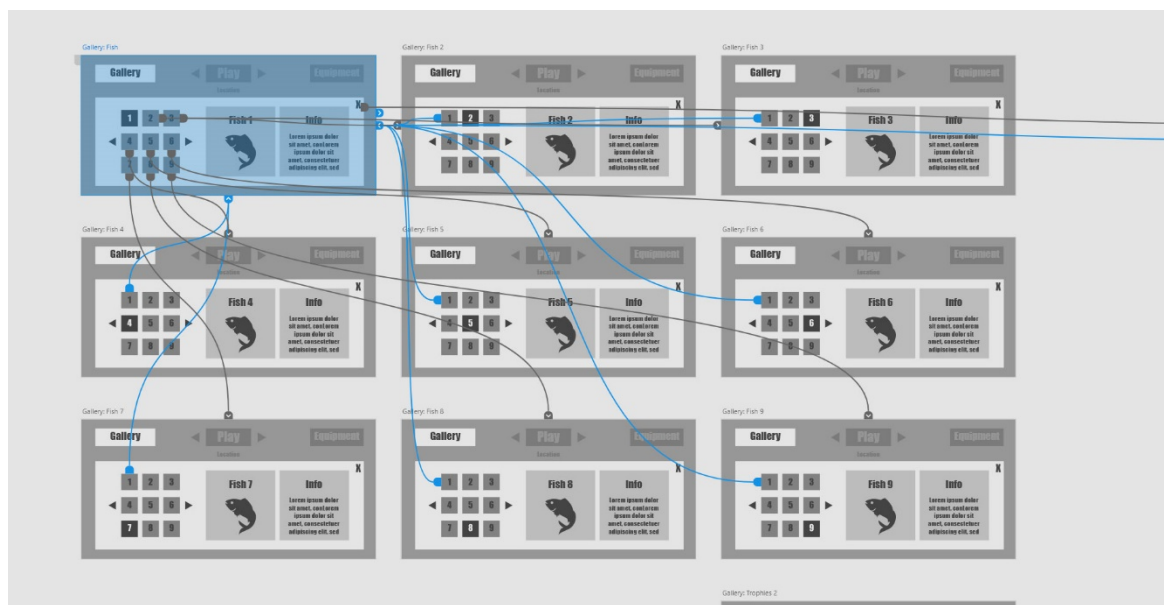


Figure 13. Menu assembly in iteration one prototype.

These states would need to be connected to all other possible states, in order for the menu to work. Enabling this method of navigating within Adobe XD was clunky. The second iteration (Figure 14) changed this by removing the need of having a highlighted button to indicate which object is selected currently in the menu. This was done by having one interconnecting menu, from where a button would lead only to the corresponding sub-menu.

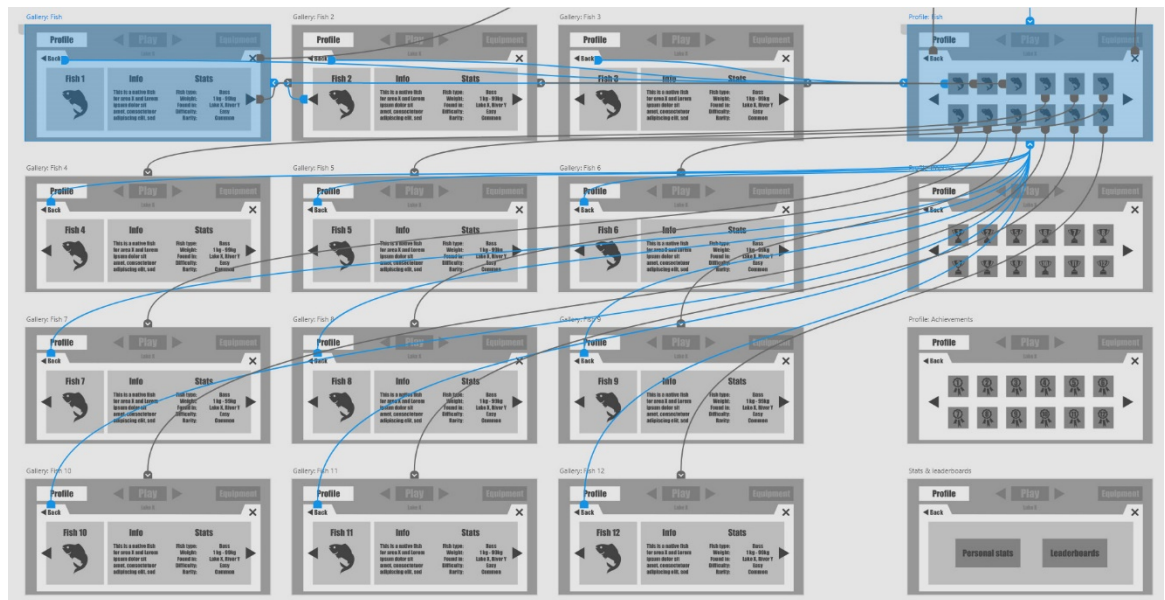


Figure 14. Menu assembly in iteration two prototype

During the compilation of the second prototype, an additional change regarding user experience was discovered. The user experience would be enhanced if navigational arrows were to be implemented in the collectible sub-menus. This way the user would not need to navigate back and forth in the sub-menus, for example if they want to go from trophy one to trophy two (Figure 14).

### 3.3.3 User testing

The second user testing was conducted similar to the first one. Majority of the testers were different, save for two testers. In total six people participated in the second user testing. Again the testers were given a brief introduction and guidelines, then they were handed a phone with the latest version of the prototype and a notebook to write down their feedback. Compared to the first user testing, the testers were more agreeable to write down extensive feedback if feasible. As far as time was concerned, the tests were not any shorter or longer than the previous time. When a tester was done, they were instructed to give a brief summary and go through the notes with the author. This was done in order to diminish the amount errors that could possibly surface during the analysis.

### 3.3.4 Analysis

As with the first user testing the results were positive overall, but this time more valuable information was given on the design flaws. According to the feedback majority of the existing elements were in appropriate condition in the terms of size and placement, with a few exceptions. Usability had issues on the clarity according to some testers. Their expectations were not met on certain occasions, for example there were no page count indicators anywhere (Figure 15).

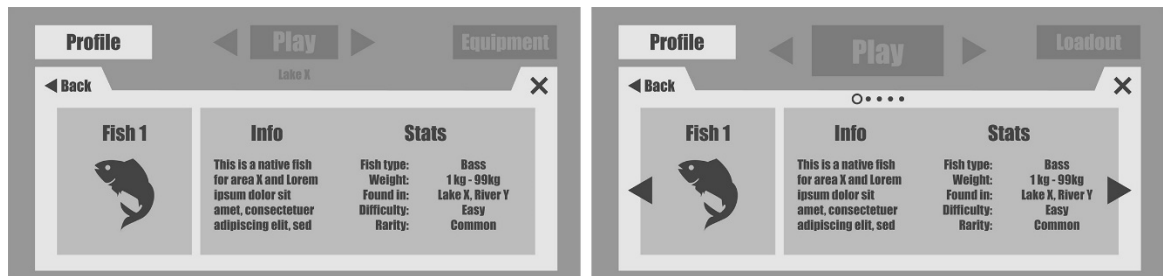


Figure 15. Page indicator missing in iteration two.

The login screen and welcome screen had small inconveniences that could be easily adjusted. A suggestion was given to move the registration button from the side to between the password bar and the login button. Multiple testers mentioned that the login screen was perceived as the main menu. Welcome screen has two buttons, tutorials and main menu. When the latter was pressed, the users were slightly confused when it took them to the game's main menu instead of the login screen. Suggested action was to change it to skip to indicate skipping the tutorials and the welcome screen. Tutorials were commented on having a minor inconvenience, the next button in the last tutorial could be named got it in order to indicate the end of tutorials and transition to the main menu.

Scalability of the various sub-menus was brought up during the testing. According to a tester majority of them could support further upscaling in the future if required, but for example equipment and options demand an overhaul in that manner. Options incorporated a plethora of flaws, ranging from naming to scalability and the very contents of the sub-menu. As suggested by the testers, the division of options and news into individual sub-menus meant reinstating the design of the first iteration. Profile was not under any major design changes, but

only the addition of indicators for scalability. Navigation arrows and current page pointers were to be added.

Equipment would have passed with fewer changes if not for the matter of scalability. Major changes regarding navigation within the sub-menu had to be made as well as minor adjustments in some buttons and naming. In the previous design, opening the equipment would immediately take the user to choosing an item and attachments to it (Figure 16).

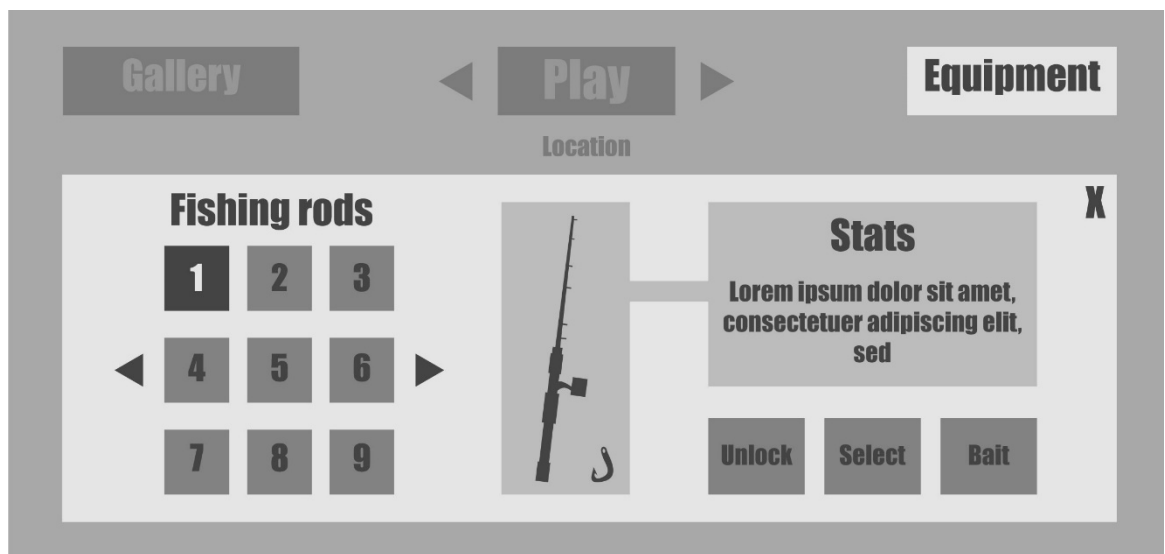


Figure 16. Second iteration equipment sub-menu.

This left little room for scalability in the design and a similar solution for change that was used in the personal stats and leaderboards was utilised here. Clearly separating the elements into their respective sub-menus, instead of interconnecting, gave more clarity to the design.

Two testers mentioned the lack of an option to check and possibly switch the currently equipped items immediately before entering the game. Loadouts, set of items selected before entering into a game, were not taken into account in the design process before and this gave a perfect opportunity to test said design option. Additionally, this change would affect the name and design of the equipment sub-menu.

### **3.4 Final iteration**

The process progressed at a faster pace than the previous iterations due to experience gained from them and a proper grasp of the workflow. The final iteration does not include further user testing or analysis as the project was set to three iteration cycles and would be considered complete at that point. Three iterations were enough to locate the major design flaws. Findings in the last iteration will be touched upon in the conclusion chapter when the project will be discussed overall.

#### **3.4.1 Wireframe improvements**

The workflow of the previous iteration cycles have been proven to work properly and did not require changes. The design changes were based on the analysis of the latest user testing data. The improvements were implemented in the following order: login screen, welcome screen, tutorial, the main menu, profile, equipment, options, news and the sub-menu from the play button.

The login screen and the welcome screen both had a minor change to them. In the prior mentioned, place of the registration button was adjusted from the side of the login bars to be placed between password bar and the login button. In the latter, the main menu button was renamed into skip. In the tutorial, the last button prompt that was named next was renamed in order to indicate the ending of the tutorial.

In the main menu, changes ranged from minor adjustments in scaling into renaming of buttons. Majority of these adjustments were needed to be taken into account in the sub-menu backgrounds. The play button was slightly upscaled and the navigation buttons meant for switching the chosen in-game area, for example a river or a lake, were moved from around the play button to around the area indicator (Figure 17).

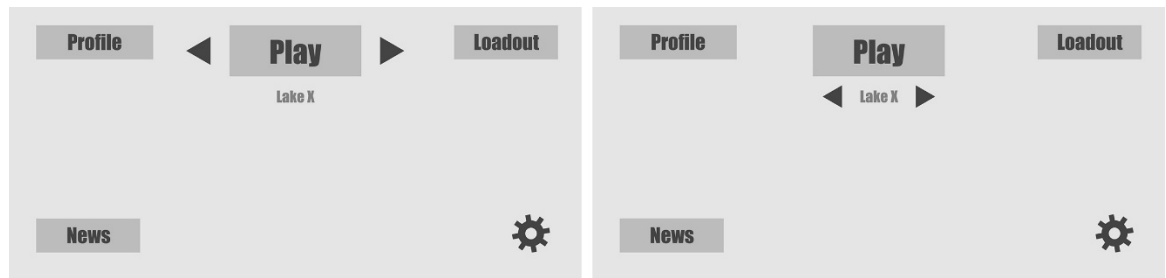


Figure 17. Play button adjustments.

The latter adjustment was reverted as it proved to hinder the usability in the prototype. Equipment was renamed into loadout in order to better convey the meaning behind the sub-menu. Other changes made later in the process benefitted from this modification by keeping the overall design unified. With the suggested split of options and news sub-menu, the button for news had to be reinstated. The news sub-menu button was placed on the left side of the screen, so it would be operated with the user's left hand.

The profile sub-menu and its subsequent sub-menus were affected by two adjustments, navigation arrows and current page pointers. The prior mentioned was added to the all sub-menus other than the personal stats and leaderboards, the latter being added to all sub-menus with navigation arrows except the stat page in the fishes, trophies and achievements. The navigation button X was changed from taking the player straight to main menu into taking the player only to profile.

The loadout underwent extensive design changes based on the analysed data from the user testing feedback. Additional analysis on the possible shortcomings in the first draft of the new design prompted a second, smaller, iteration before anything was implemented properly. In the first draft the placement of the sub-menu buttons made them feel disconnected and of different value, unlike they were originally intended. The second draft had the elements grouped in a similar way as the sub-menu buttons in the profile (Figure 18).

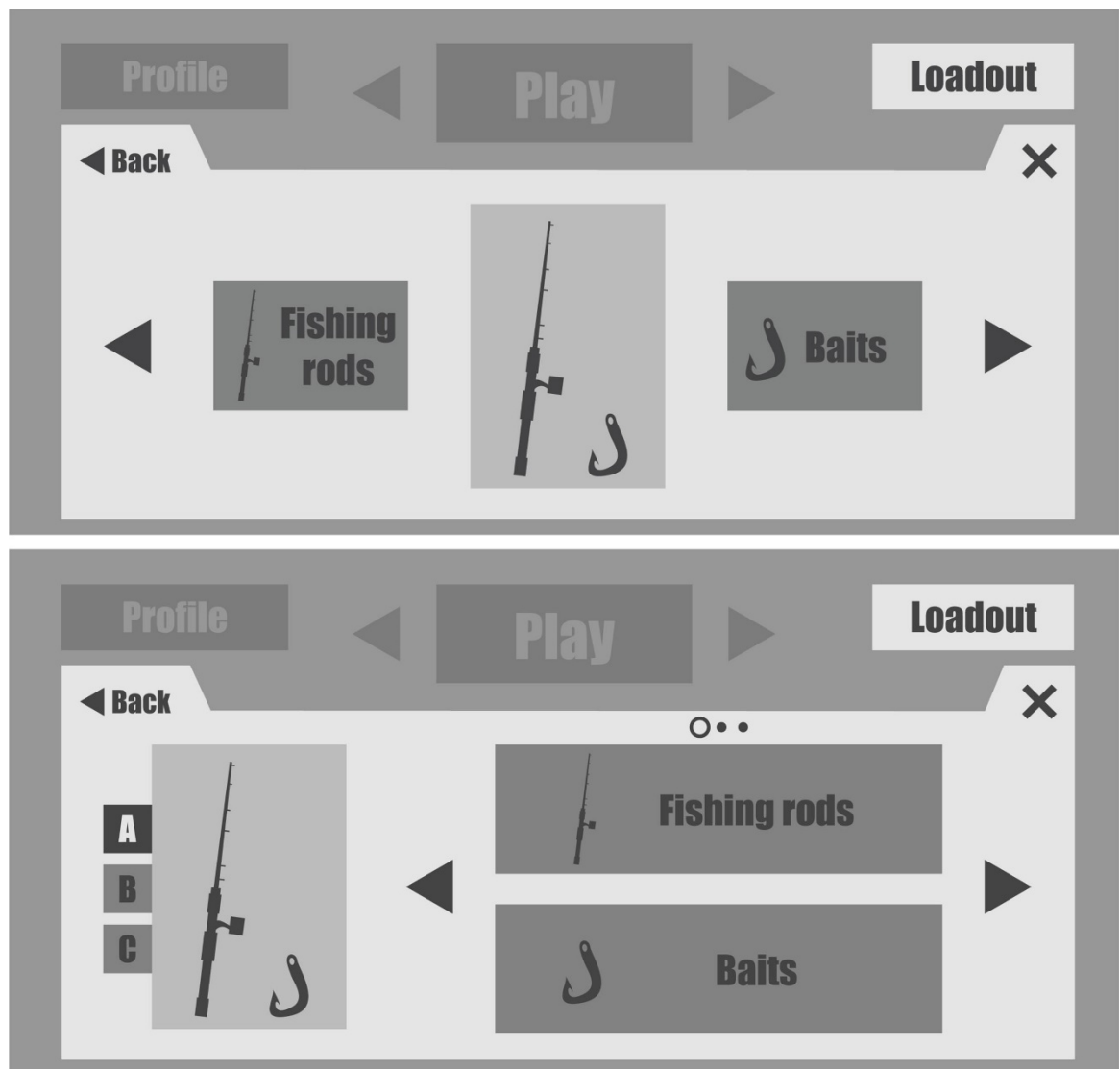


Figure 18. Quick iteration of loadout sub-menu.

Options sub-menu was reverted back nearly to the same condition as in the first iteration, leading the news to be reinstated as its own sub-menu. Name of the sub-menu was changed to settings, as it gave more detailed explanation of what it holds. The buttons, which were not affected by the separation of news, got adjusted in size to better fit the more spacious sub-menu. They were grouped up in the recurring grid system that is two elements high and width is adjusted to half of the total number of elements.

As mentioned in the latest analysis (see section 3.3.4), the lack of an event list was pointed out by a tester and the news sub-menu would be the logical place to locate it. In order to keep each element clear and easily accessible, they were

given their own respective sub-menus. This design choice has been utilised in other sub-menus and has been proven in both user tests to work properly (Figure 19).

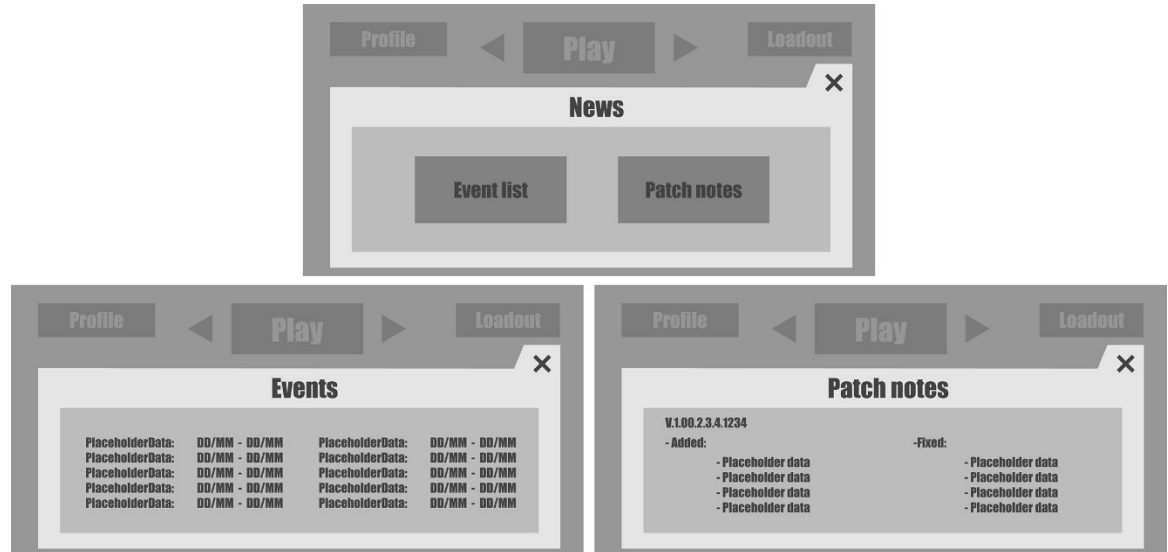


Figure 19. News sub-menu in iteration three.

The sub-menu derived from the play button had additional elements added into it. Two testers had pointed out the lack of a way to change currently equipped loadout before entering the game. Loadout buttons from the loadout sub-menu were copied and utilised in this sub-menu, their location was set to be in the bottom and middle of the screen.

### 3.4.2 Prototype updates

The prototype update in the final iteration did not introduce any new methods to the workflow, only slightly speeding up the process as more experience had been accumulated. Major or minor design changes or additions were not discovered during the implementation. The implementation process went through smoothly.

## 4 CONCLUSION

The goal of this thesis was to examine how iterative design methods can improve the user experience and usability of a mobile game's interface. The thesis showed that involving the users as testers improves the design cycle as well as



the actual design. This thesis confirmed the notions of earlier studies (see Zimmerman 2003) that iterative design approach as a part of user experience design enhances usability, even though the benefits could be perceived through only one project. In addition, the designer does not need to think of every possible outcome a user might take with each and every one of the areas within the design, as they can just rapidly make changes to the design and test it out with the users. On multiple occasions the users pointed out potential areas for design changes and the following tests proved that these adjustments had worked as they were praised to work better or were not mentioned at all.

Iterating did not exclusively happen due to user testing. Writing up all instances of changes and reasoning behind them was to be improved drastically, as this would further safeguard the integrity of the data for documentation at a later date. Better understanding about the Adobe XD program's functions and limitations left more time to be utilised in fixing the work process itself, streamlining the progress. This time save was used to, for example, change the layering method. The design process could have been improved by better observation methods during usability testing, as the participants were guided extensively instead of letting them examine the design themselves. Additionally, the actions of the testers were not intensively observed by the author, leading to loss of potential data that the participants themselves would not notice and write down. Apart from these findings the design process went well overall.

As with every design method, iterative design is not perfect. Focusing the design on iterating smaller additions may easily end up costing coherency. For example, this happened in the third iteration of the wireframe and can be seen in the appendix 3/2 — 3/3 as the tutorial box and news button got located in too close proximity to each other. A great benefit of utilising iterative design is that the project at hand is not tied into a long development cycle, it is concrete evidence for the other development teams of what is currently being done, how it functions and why it has taken the current direction.

In order to convey the project further, one final usability test could prove to be beneficial in confirming the validity of the changes made in the third iteration before moving onwards to iterating high fidelity graphics. User interface design would be studied and utilised in the making of mockups. These mockups would be applied into the prototype and put through another round of user testing to see if satisfying design choices in the terms of graphics would emerge, before implementing the whole design in the actual game.

One of the challenges in studying areas of interest that overlap in the realm of user-centered and iterative design approach is that they are widely interconnected and overlapping. Making a pinpoint definition of a single method is often difficult as an array of adjacent methodologies are intertwined with it. Studying the possibility of merging and standardization of these methodologies could potentially be the next step in their development.

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## LISTS OF FIGURES

Figure 1. Gamer Motivation Model, copyright Quantic Foundry. 2019. Available at: <https://quanticfoundry.com/wp-content/uploads/2015/12/Model-Overview.png> [Accessed 4 April 2019]

Figure 2. Combined survey data.

Figure 3. Task flow chart

Figure 4. Site map.

Figure 5. Examples of the first wireframe

Figure 6. Options and news in the first iteration.

Figure 7. Options and news in the second iteration.

Figure 8. Iteration one (left) and two (right) comparison on login, welcome and main menu screens

Figure 9. First iteration gallery compared to the second iteration profile.

Figure 10. Improvements made in iteration two.

Figure 11. Tutorial comparison between iteration one and two.

Figure 12. Example of the layering methods.

Figure 13. Menu assembly in iteration one prototype

Figure 14. Menu assembly in iteration two prototype

Figure 15. Page indicator missing in iteration two.

Figure 16. Second iteration equipment sub-menu.

Figure 17. Play button adjustments.

Figure 18. Quick iteration of loadout sub-menu

Figure 19. News sub-menu in iteration three.



# Fishing game



## Login

**Username**

**Password**

**New user?  
Register here!**



# Fishing game

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad

**skip** 

**Gallery**



**Play**

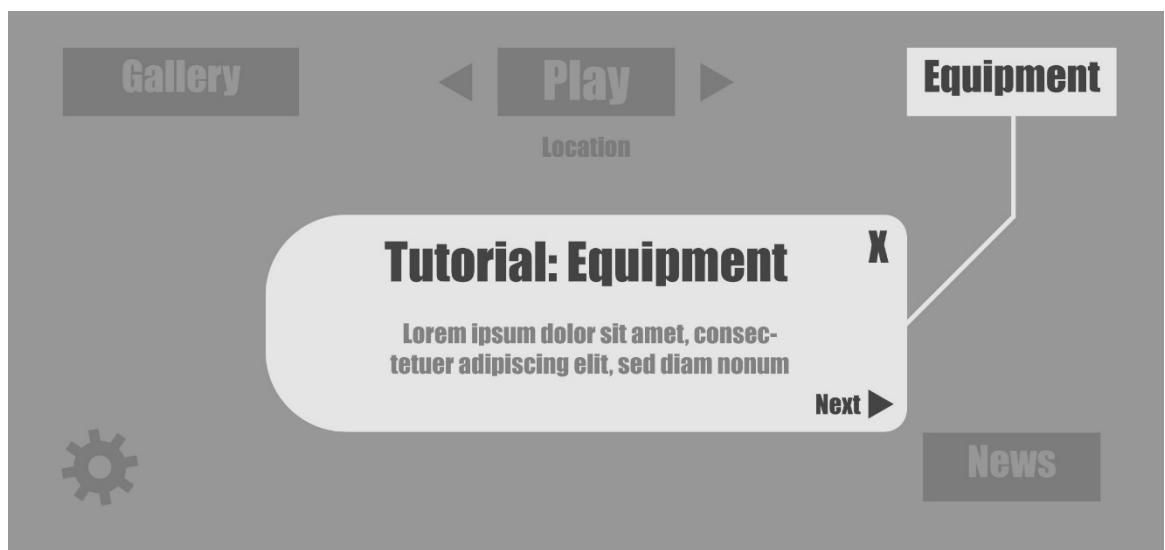
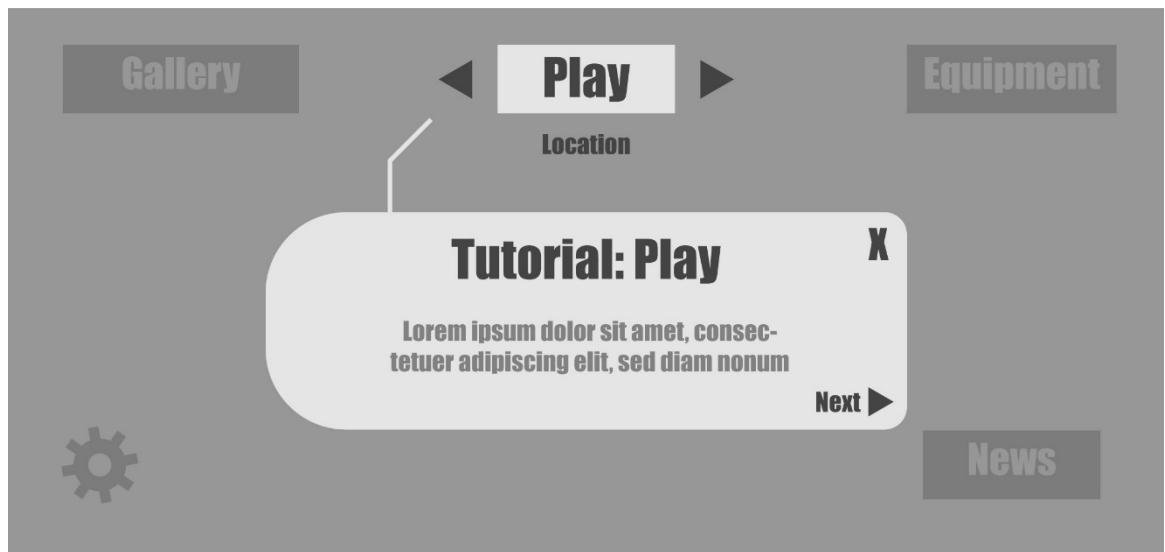
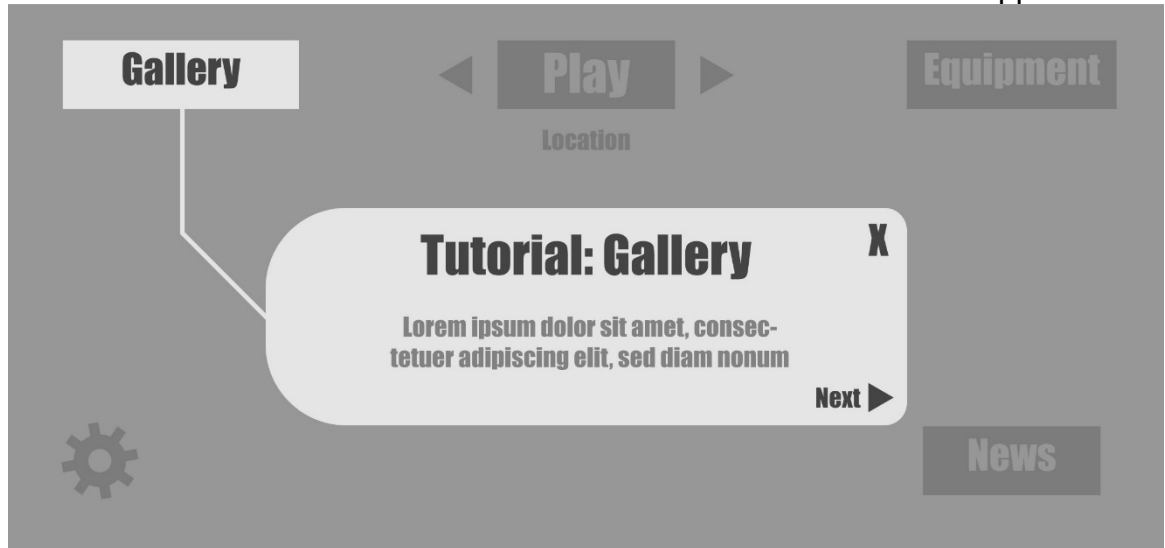


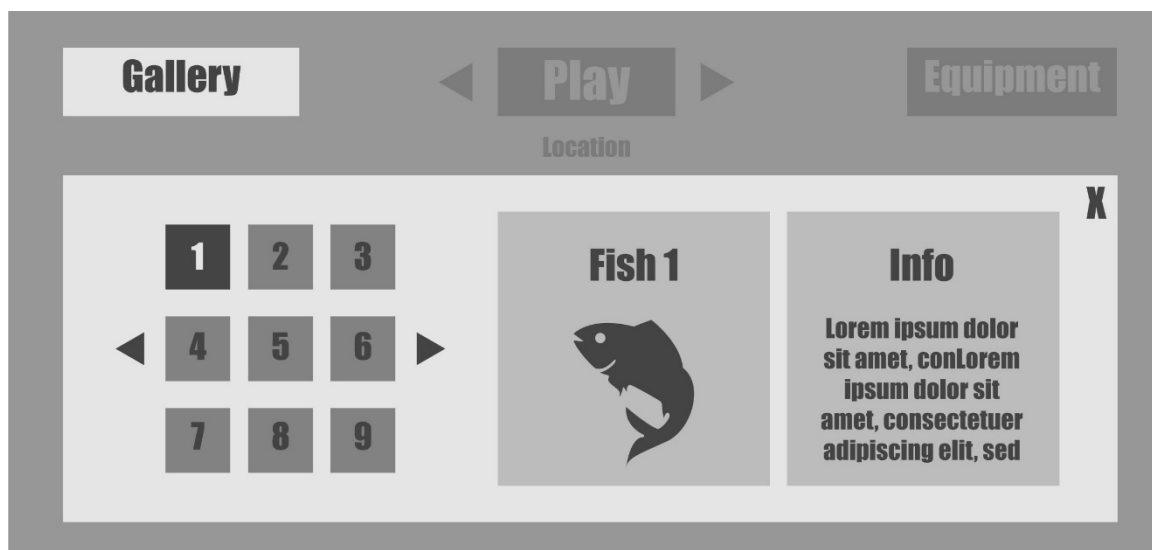
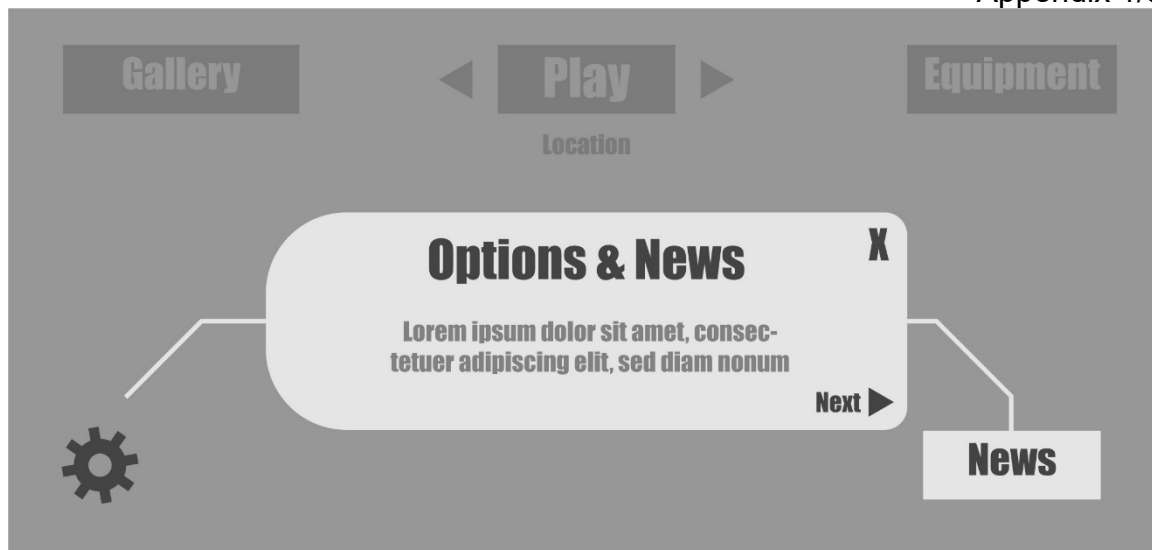
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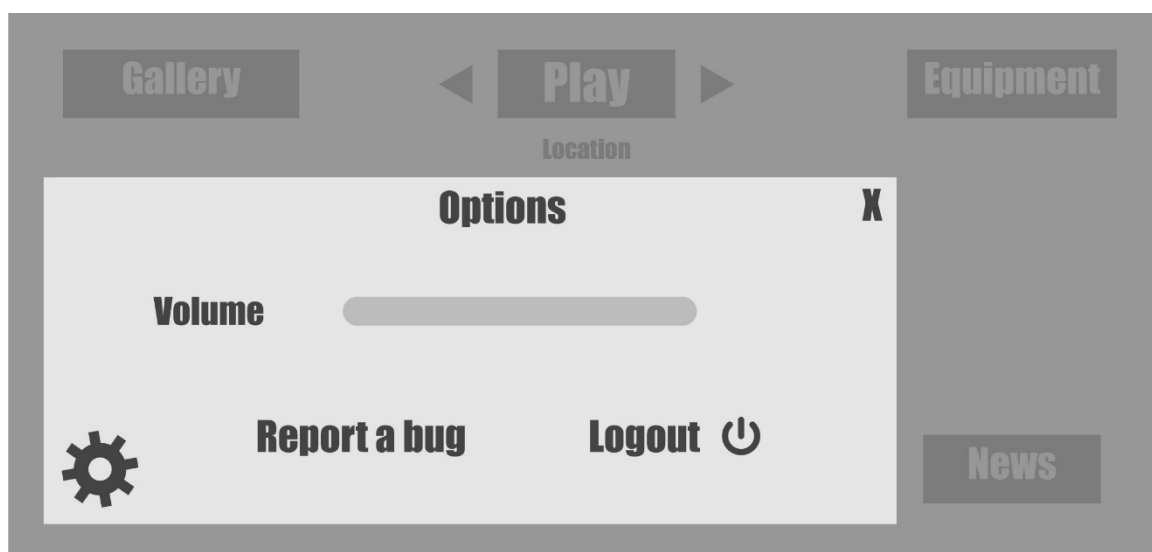
**Equipment**

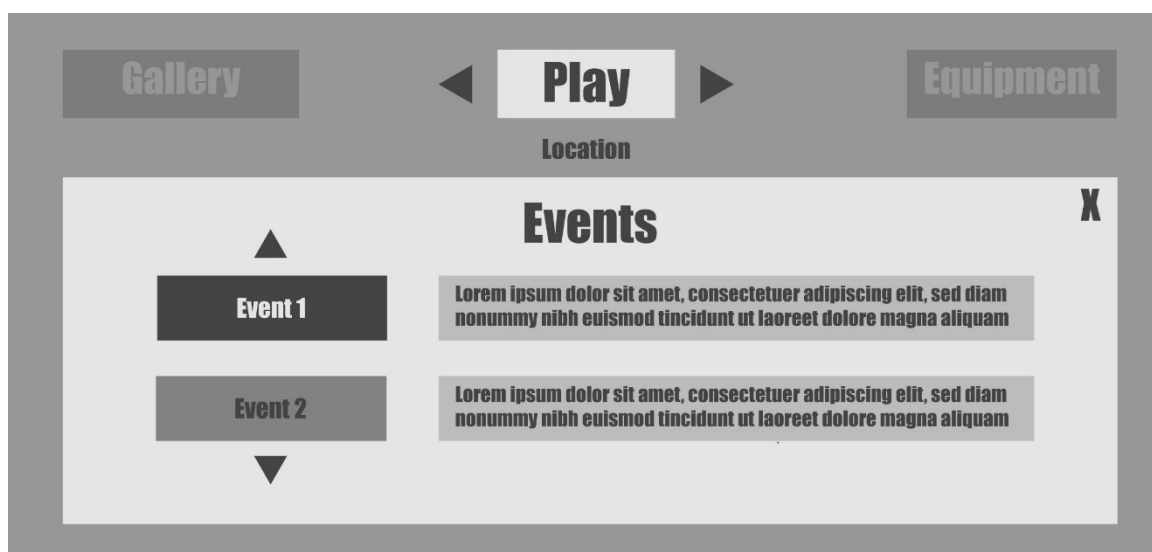
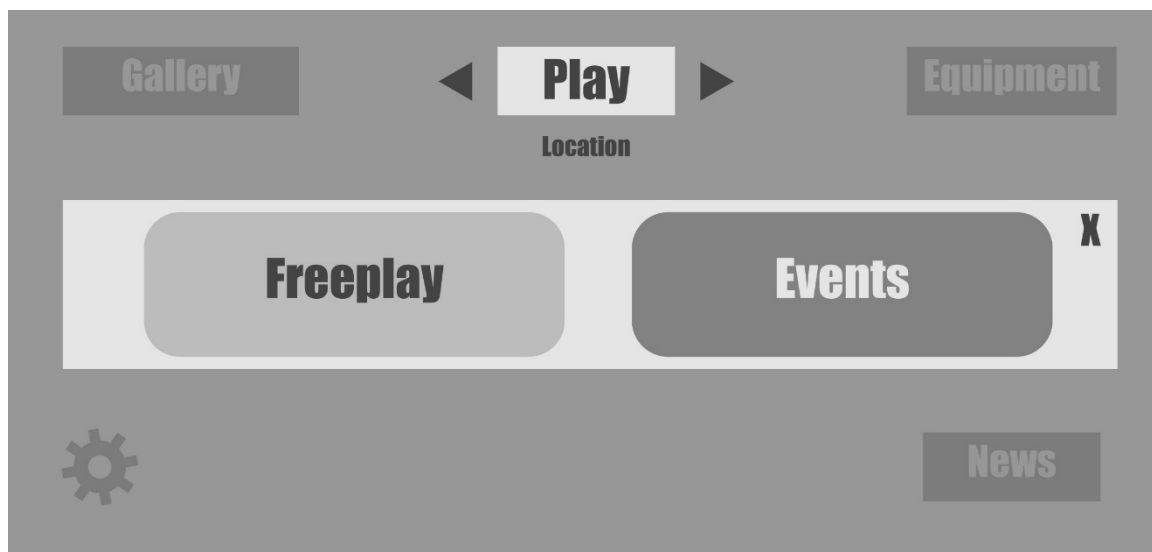
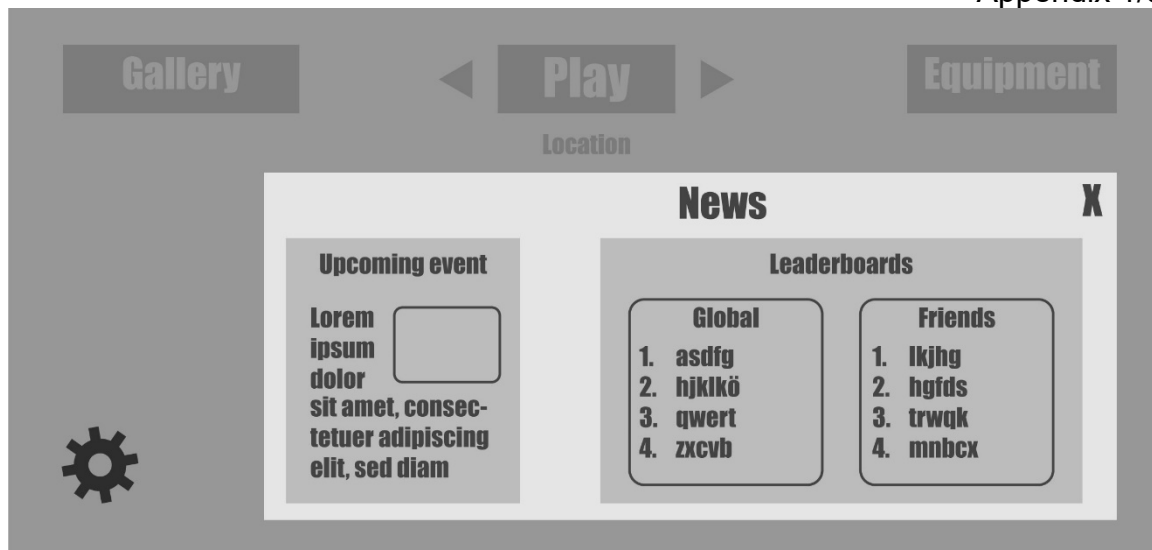


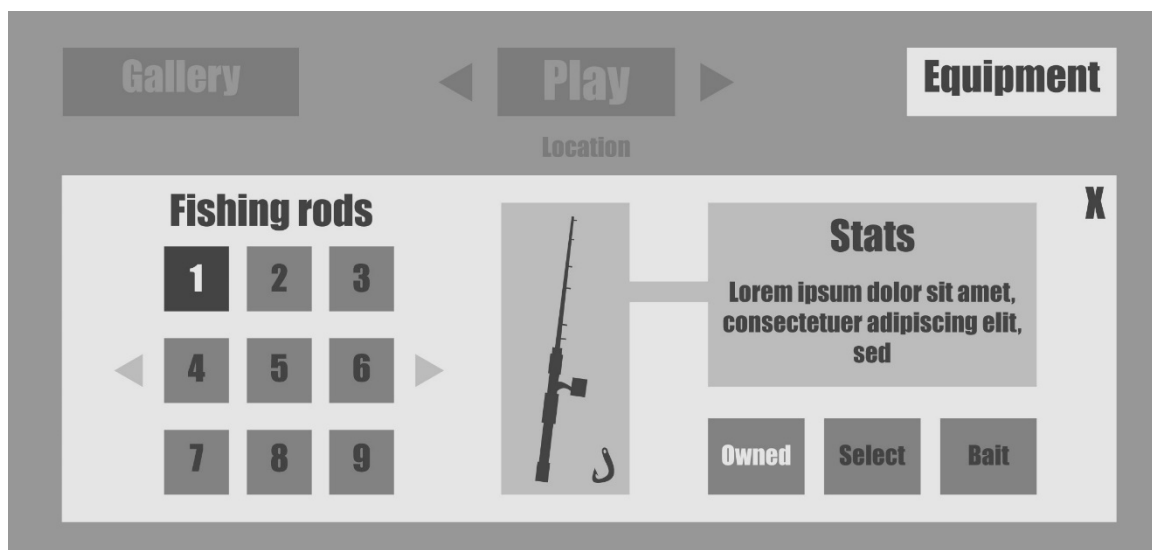
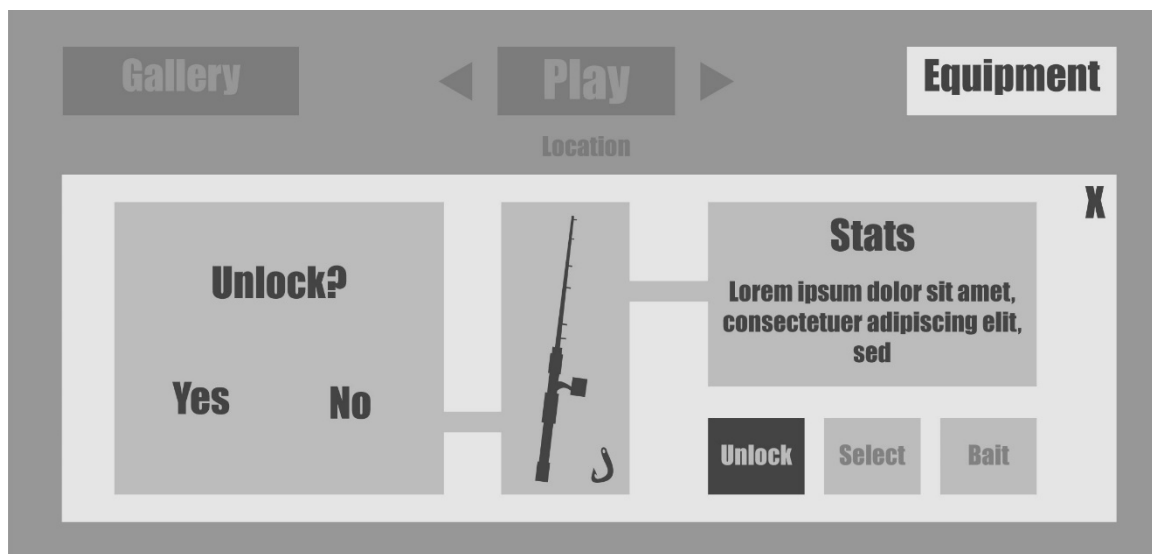
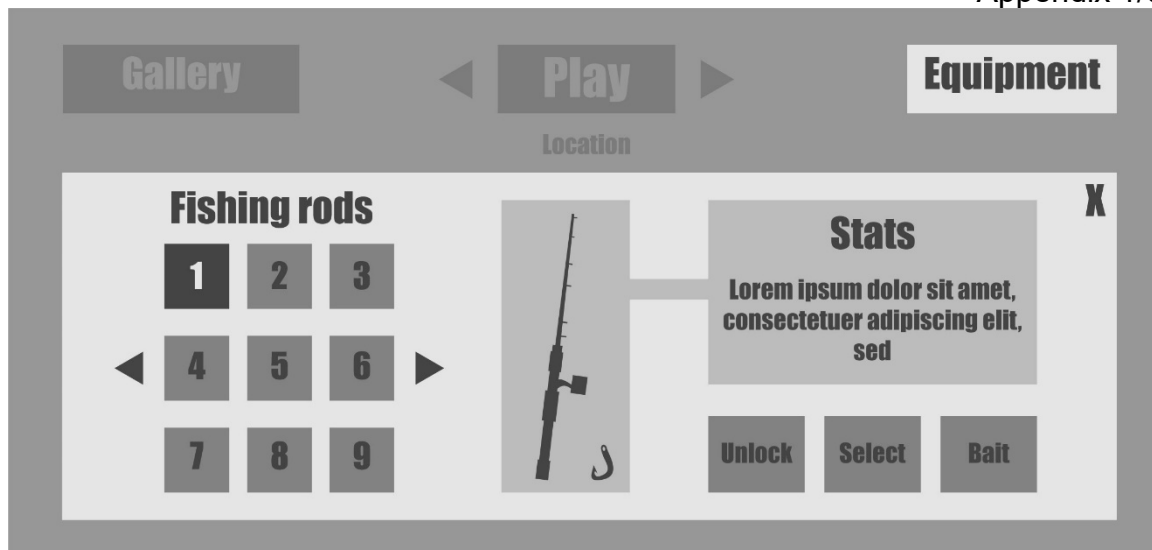
**News**

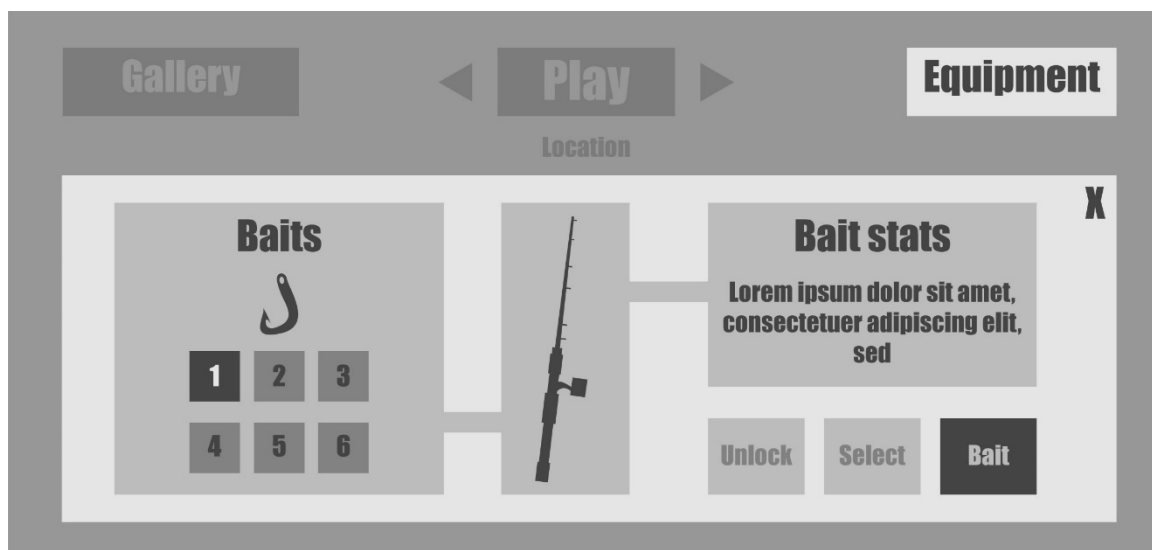
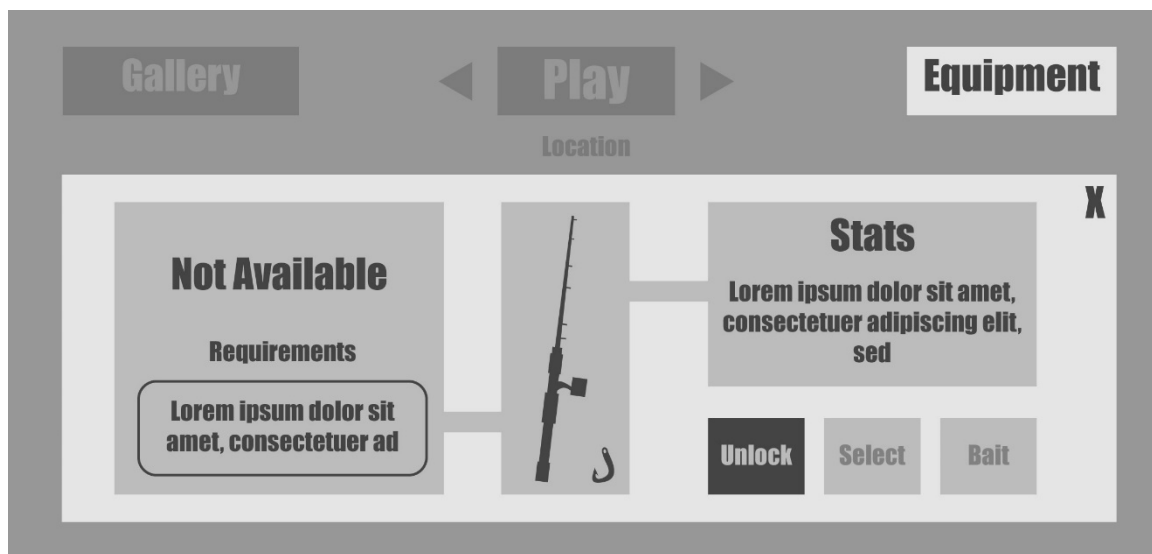
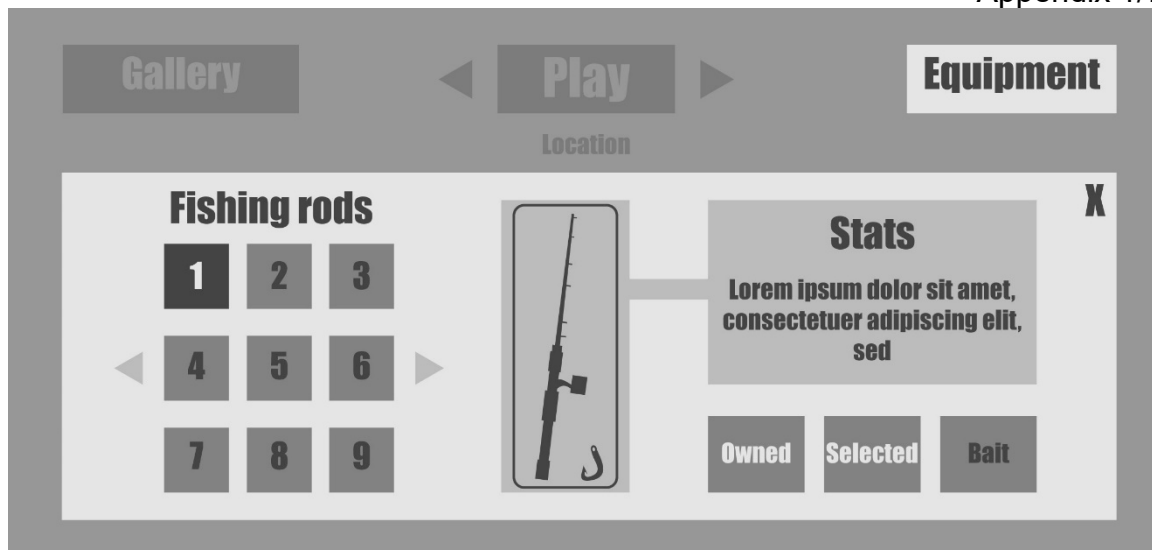


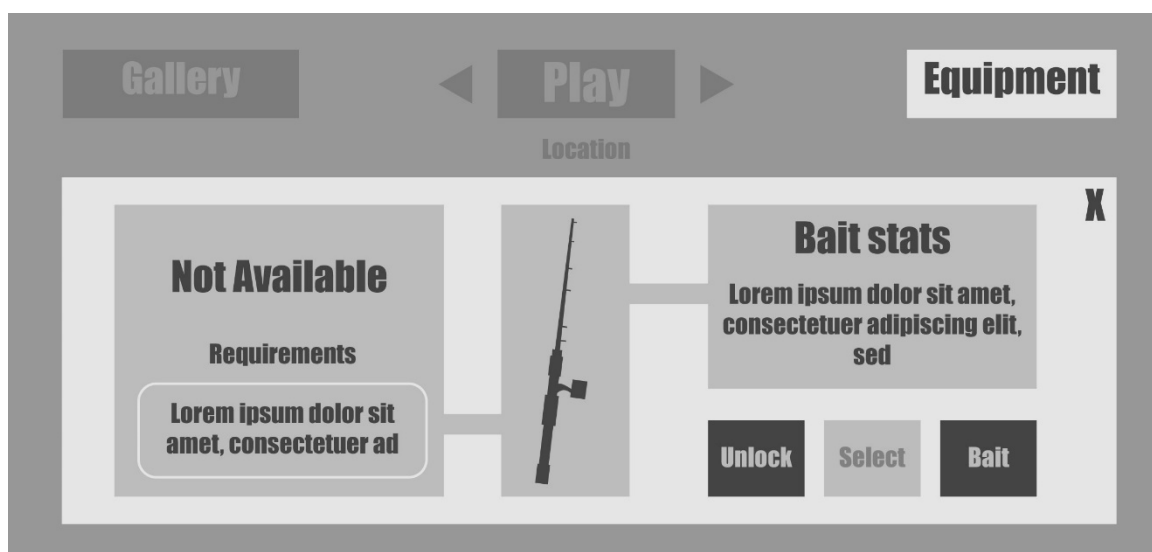
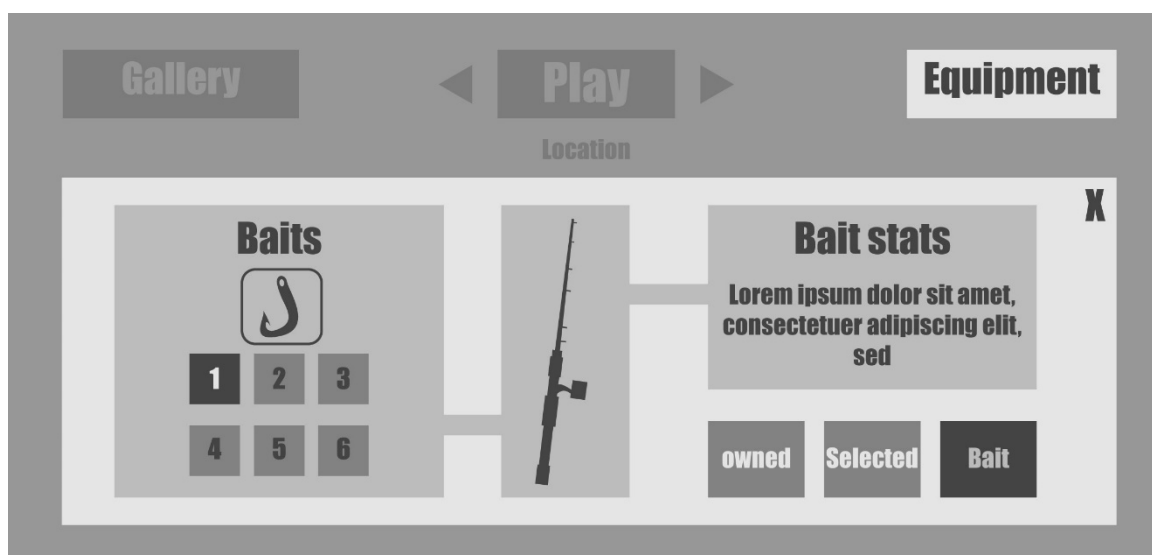
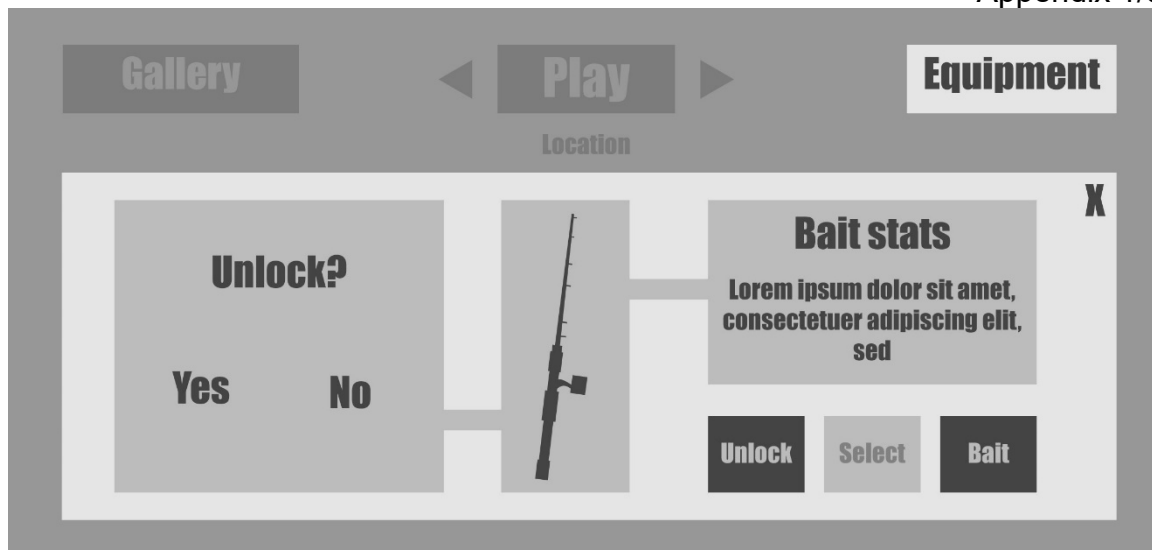














# Fishing game

Username

Password

New user?  
Register here!

Login



# Fishing game

## Options

Volume

ON

OFF

SFX

ON

OFF



## News



Upcoming event: New years party !

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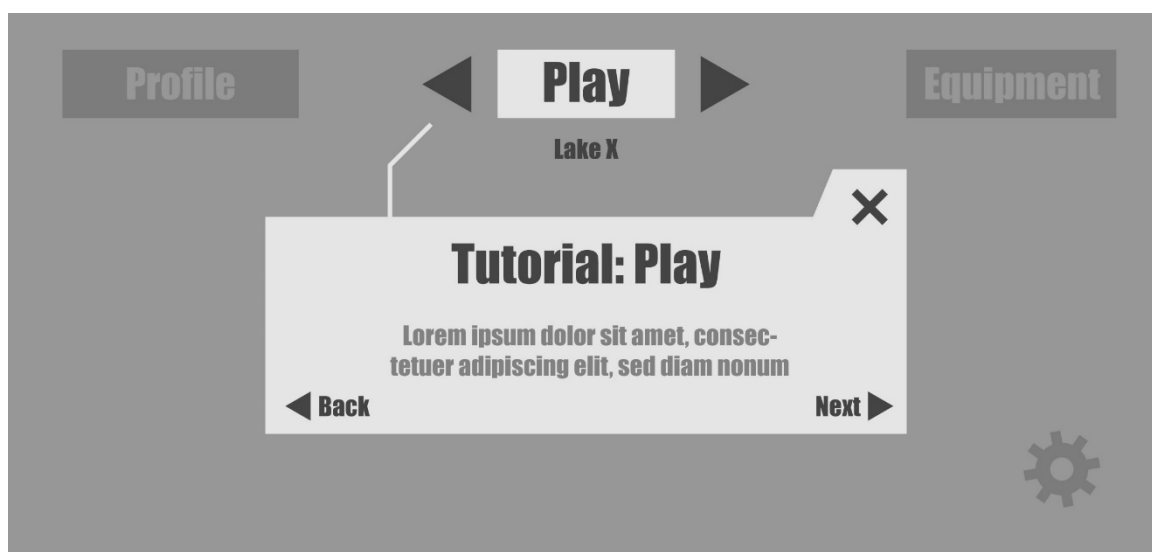
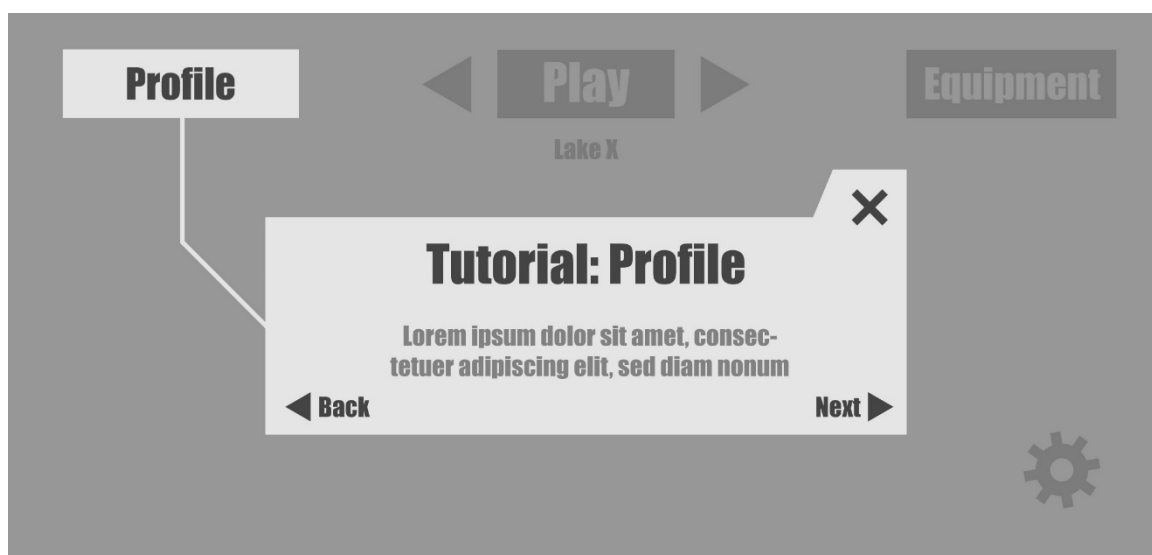
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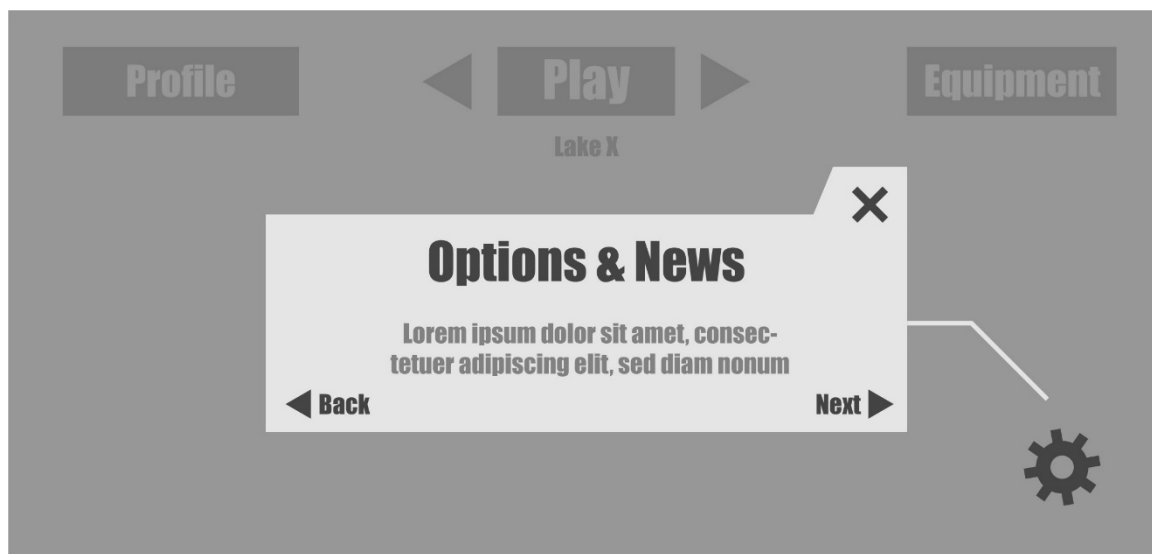
# Fishing game

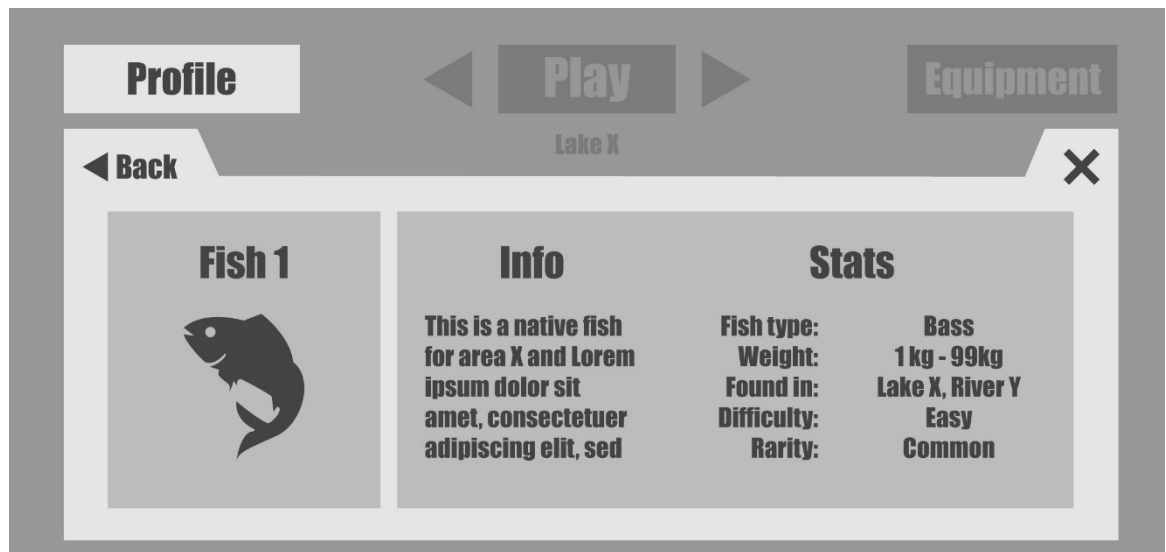
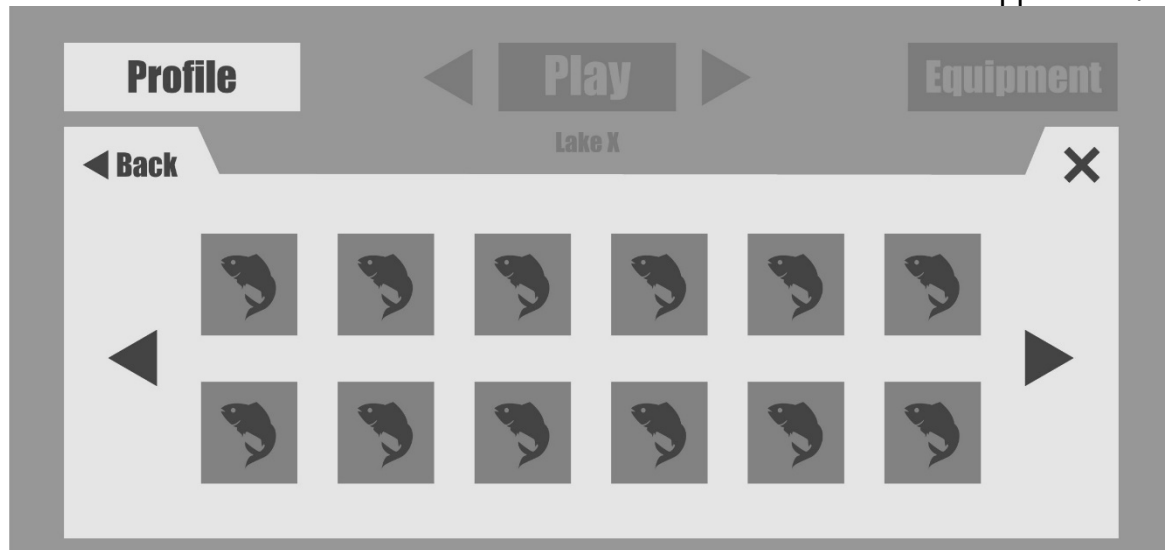
Welcome to the fishing game Lorem ipsum  
dolor sit amet, consectetuer adipiscing  
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cidunt ut laoreet dolore magna aliquam

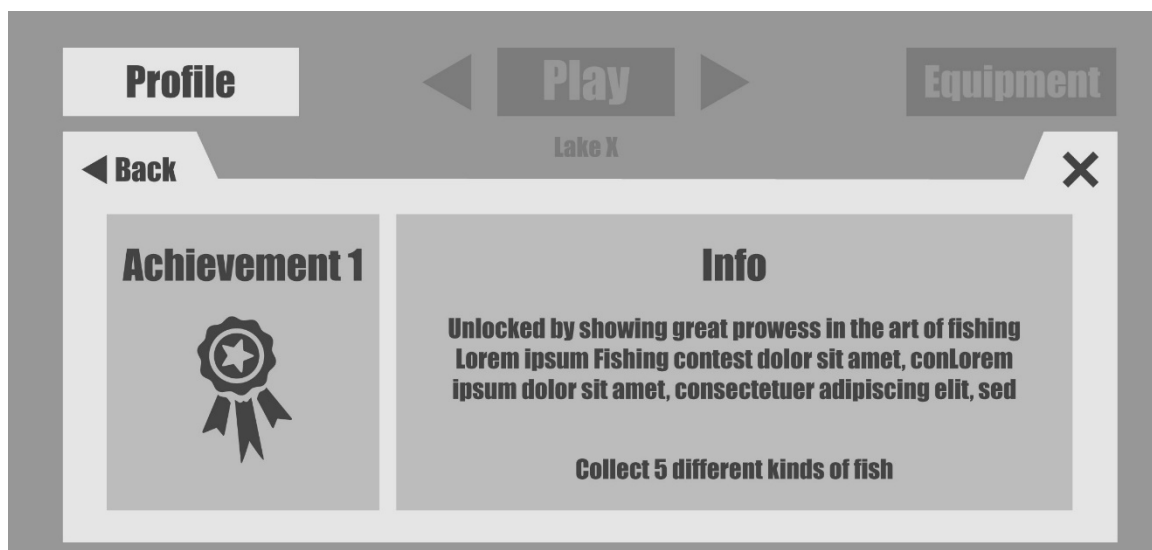
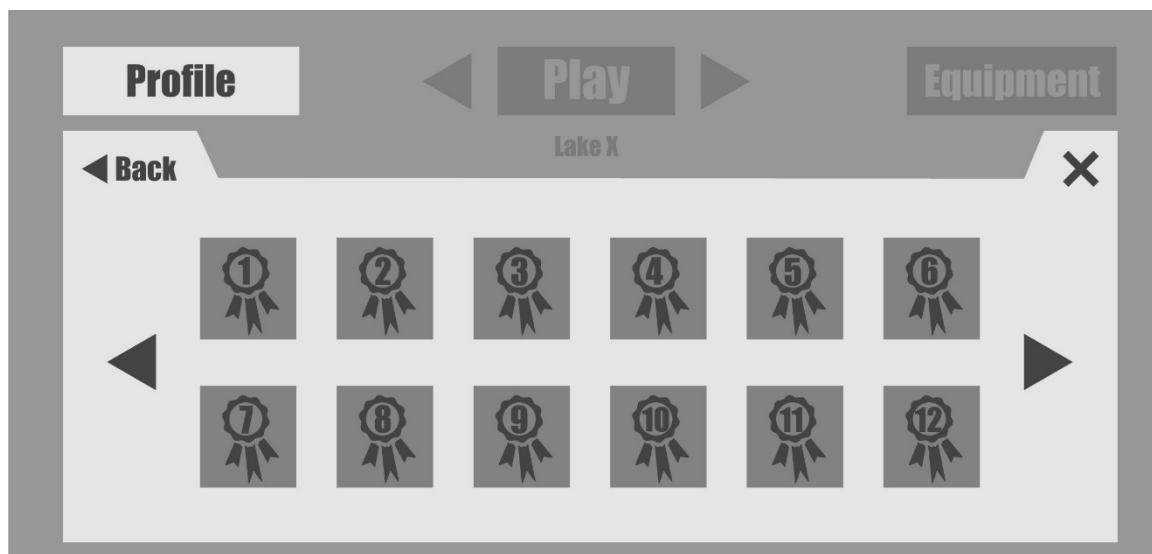
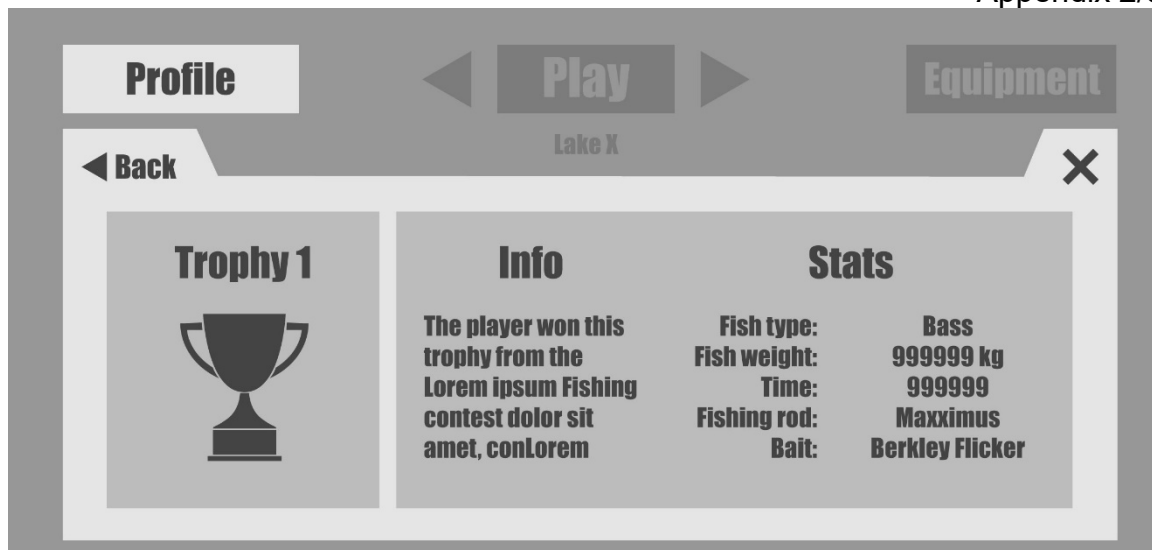
Tutorial ►

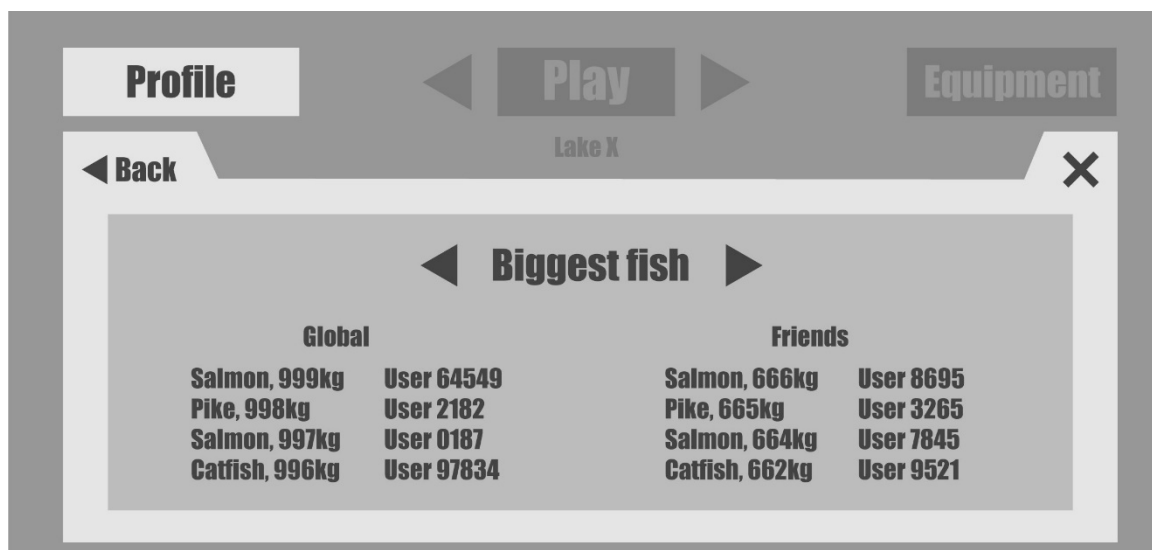
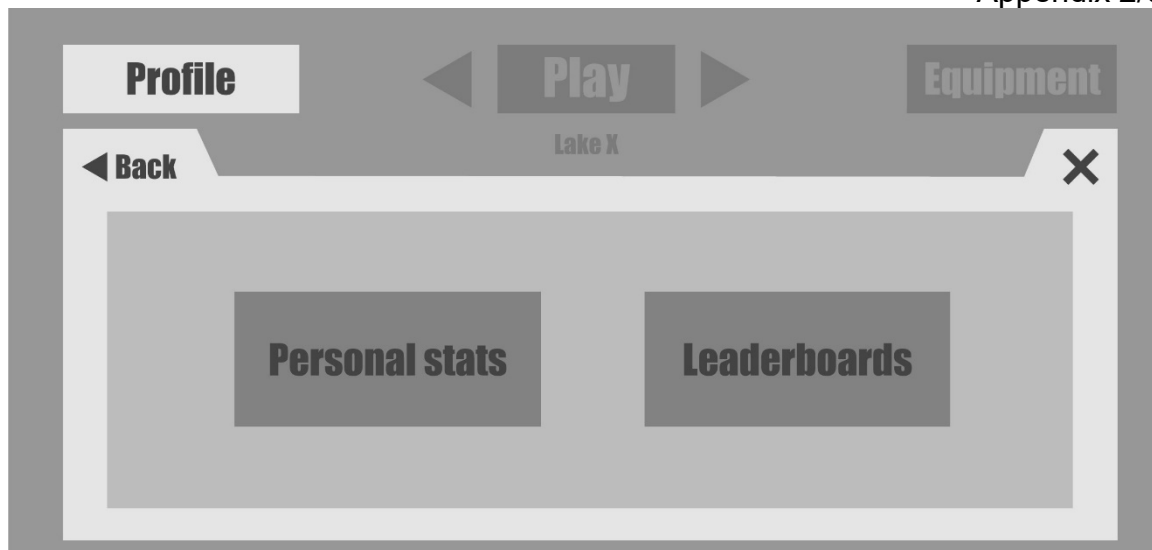
Main menu ►

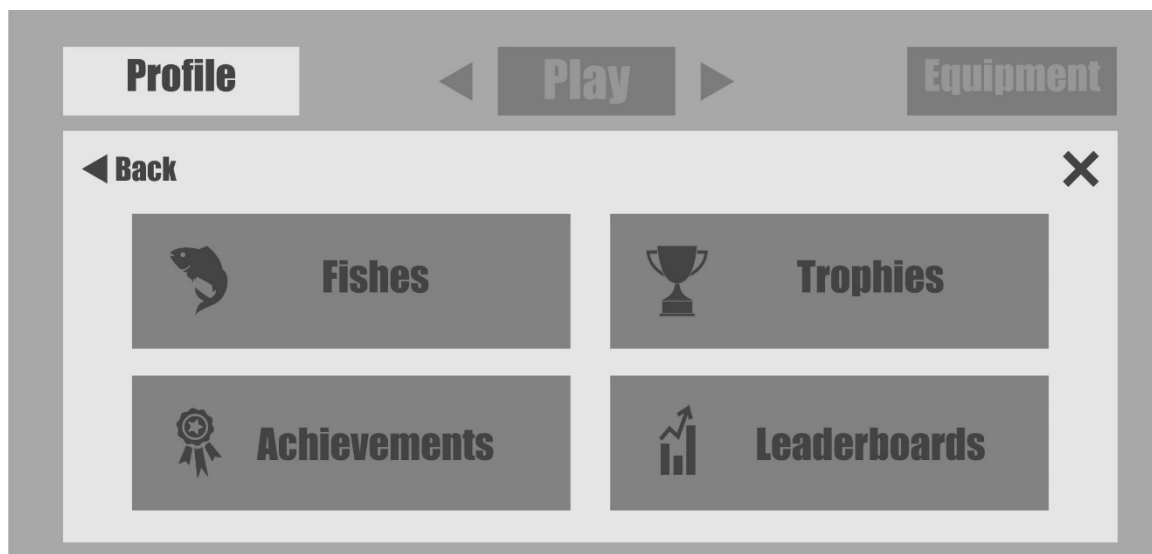
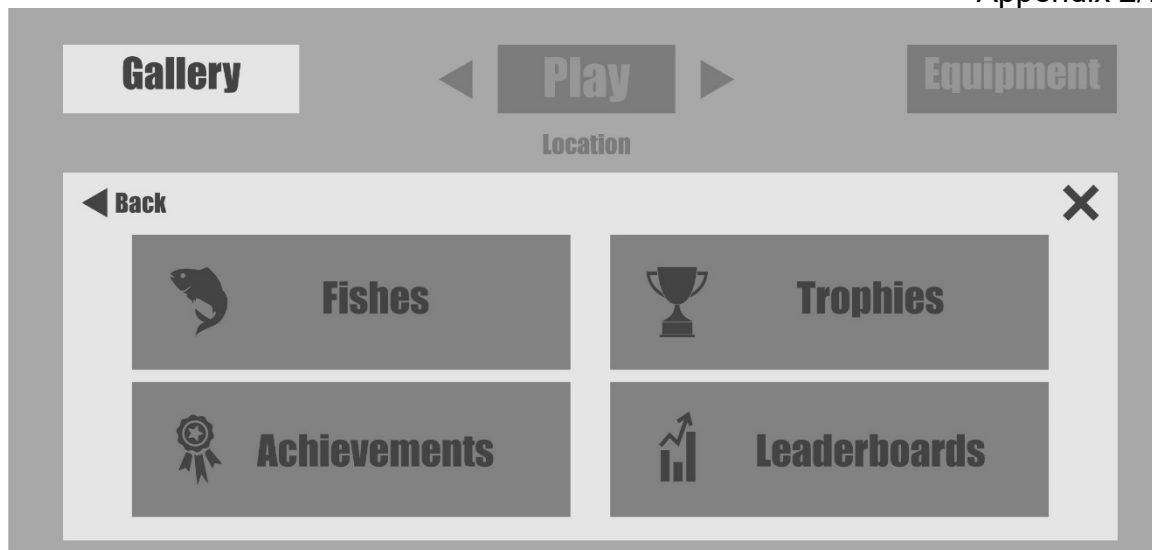


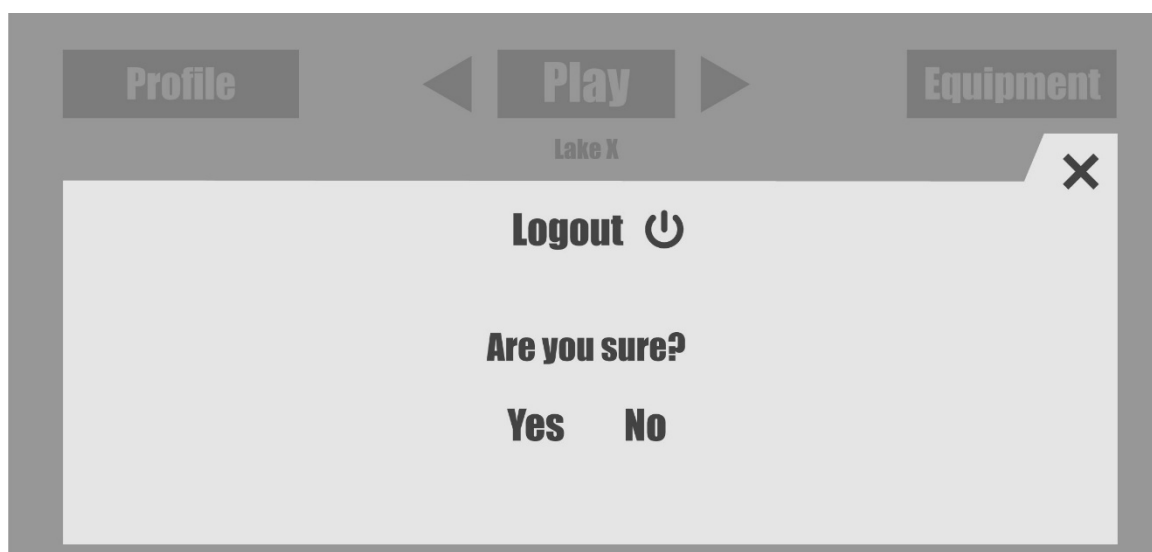




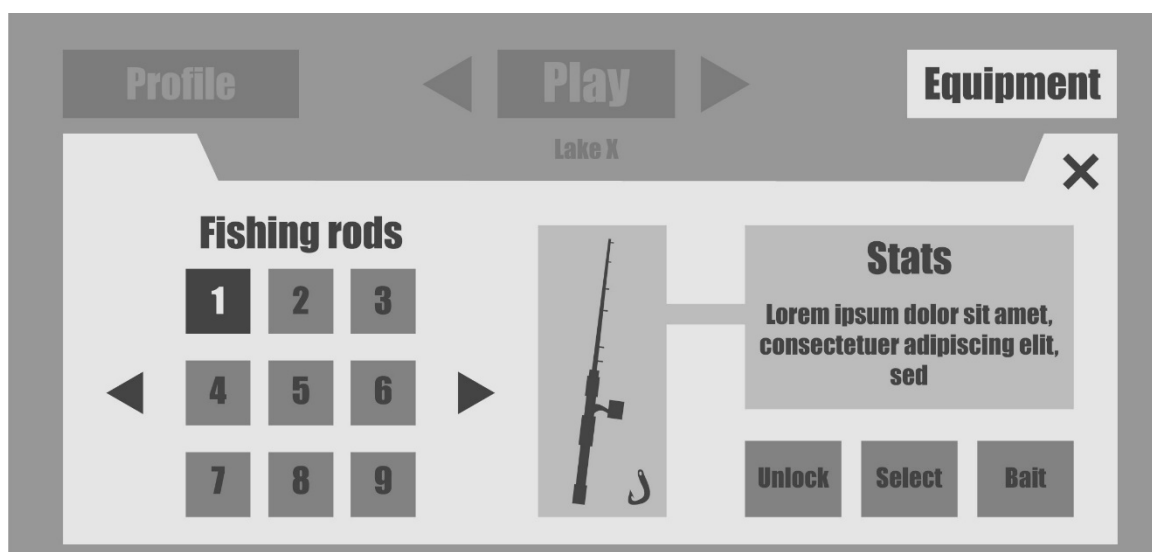
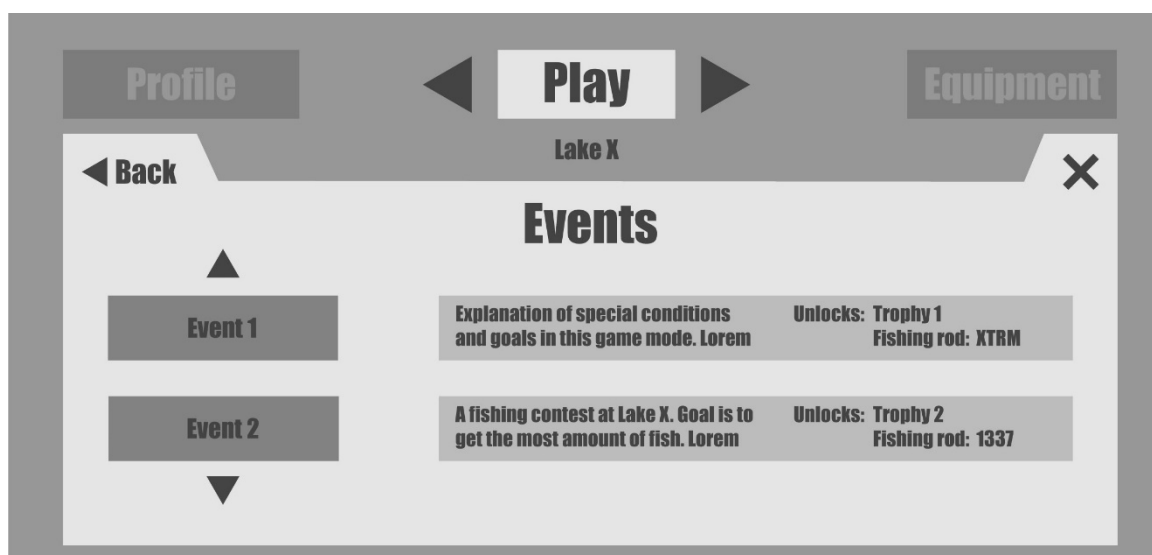
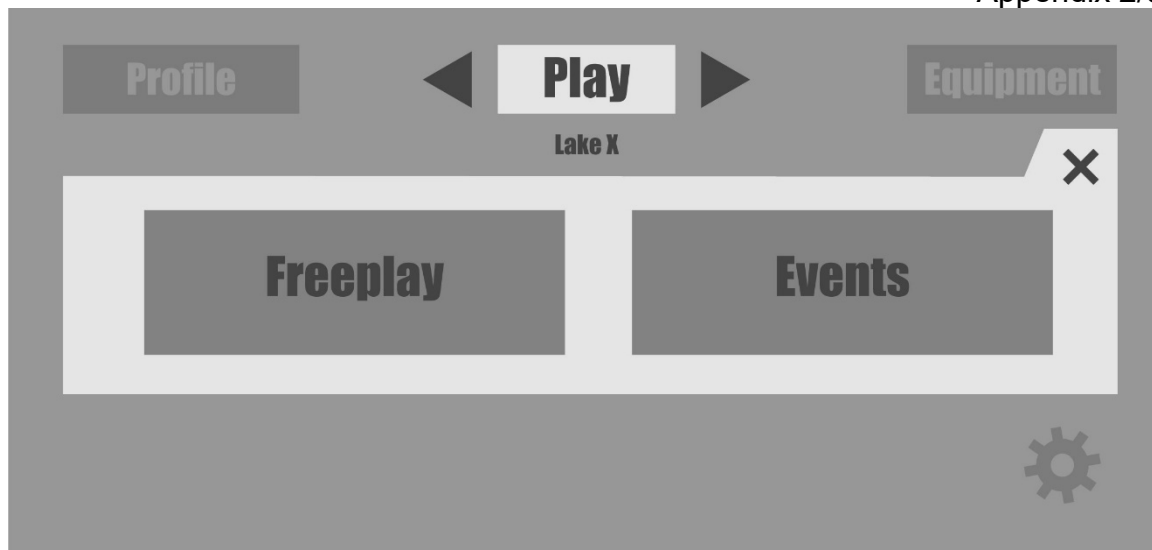


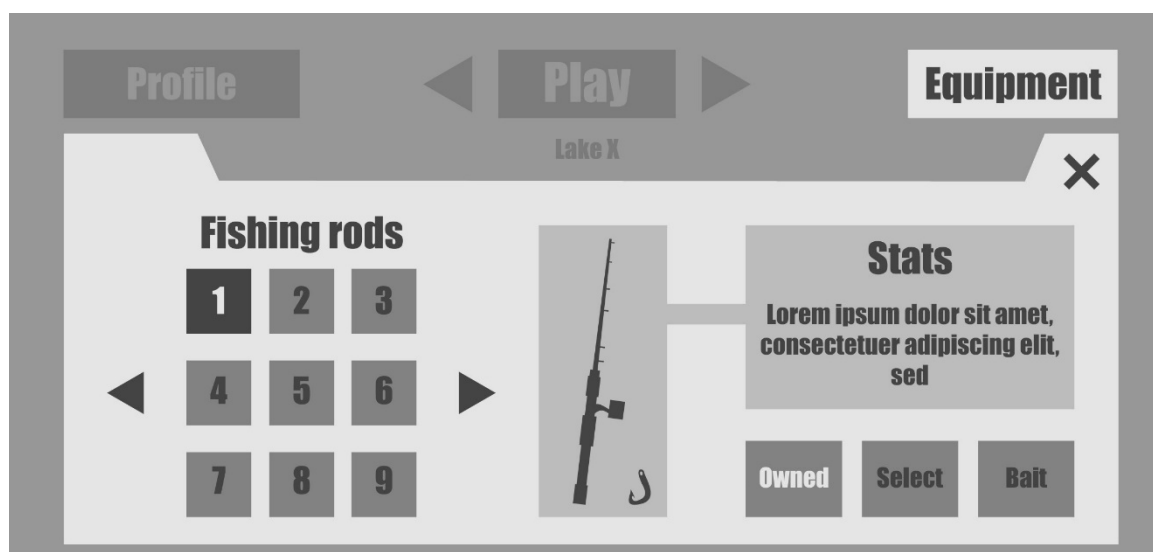
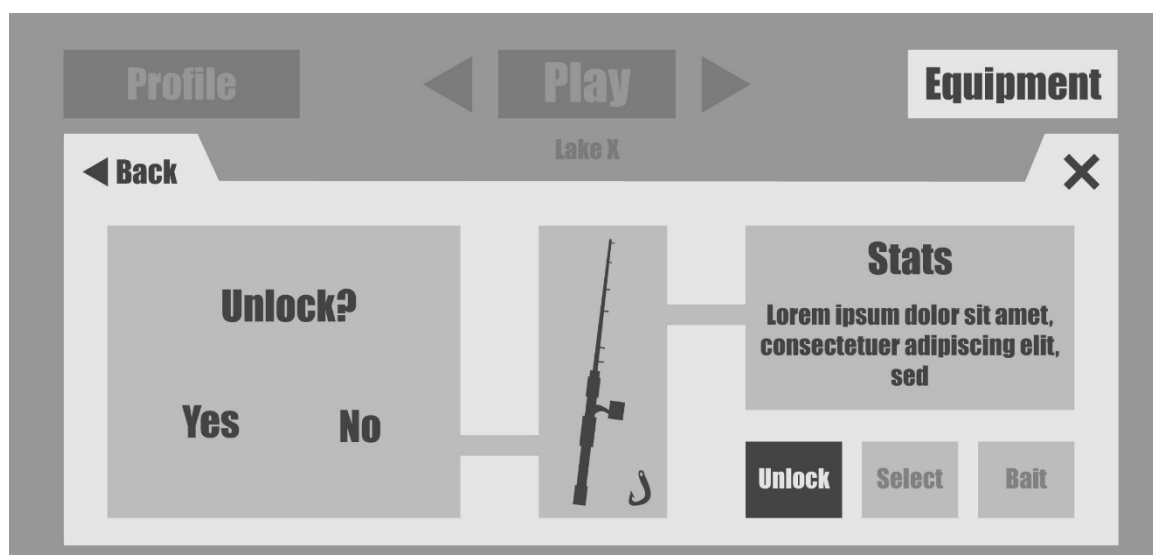
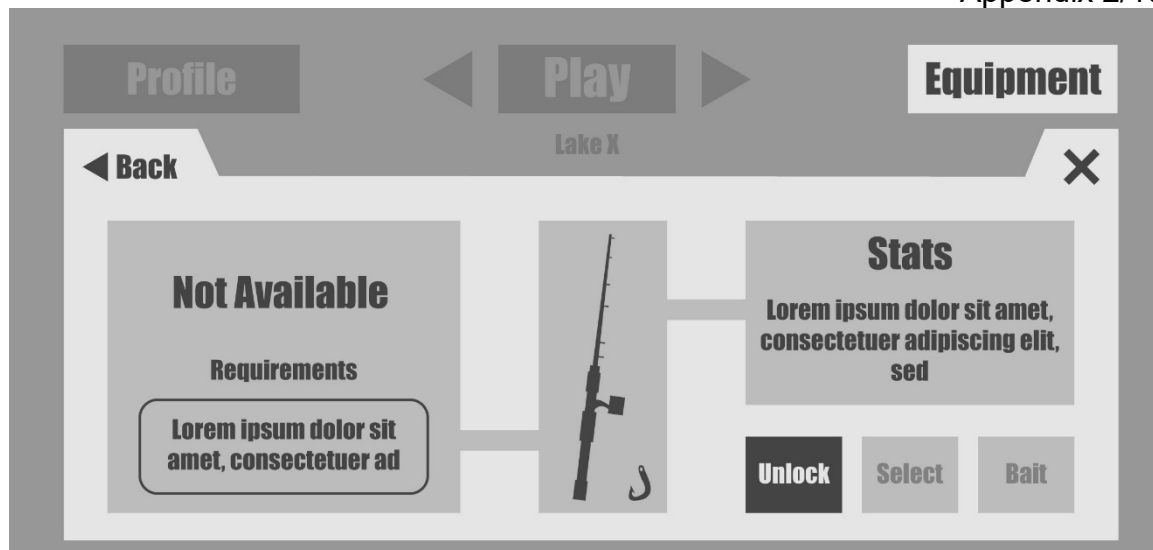


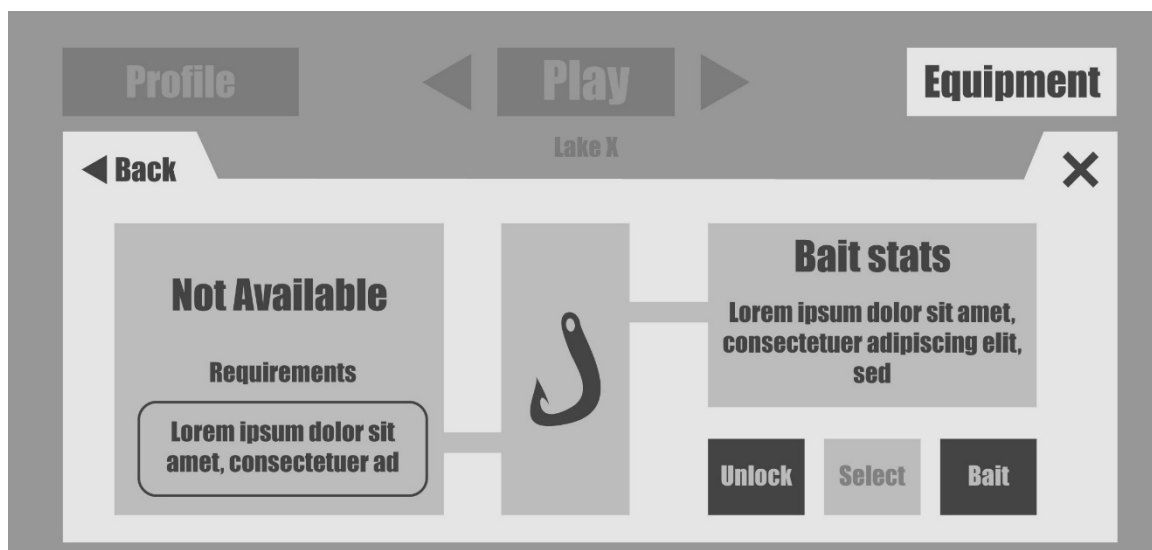
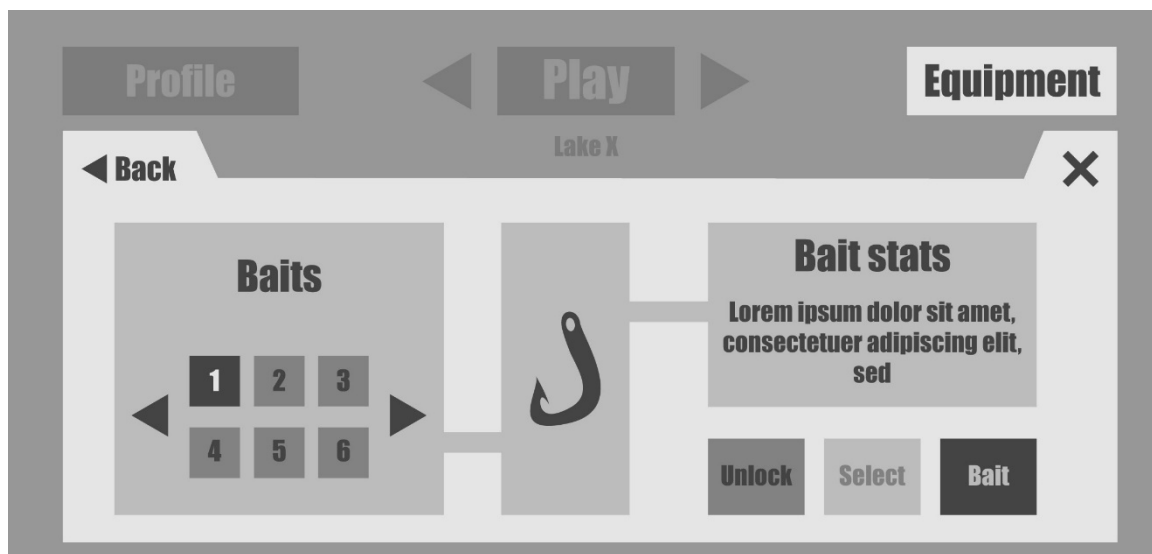
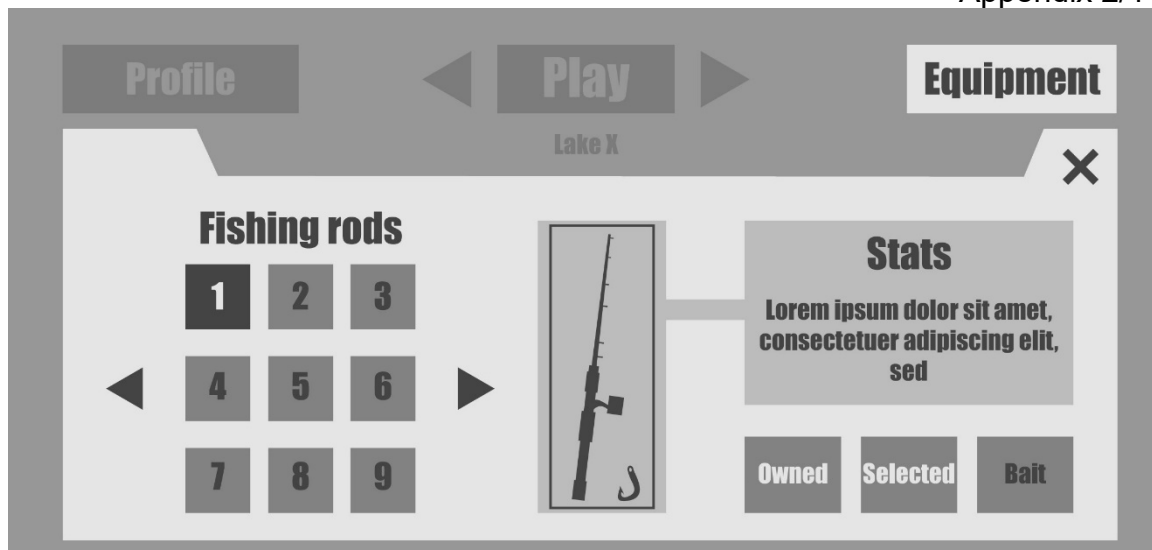


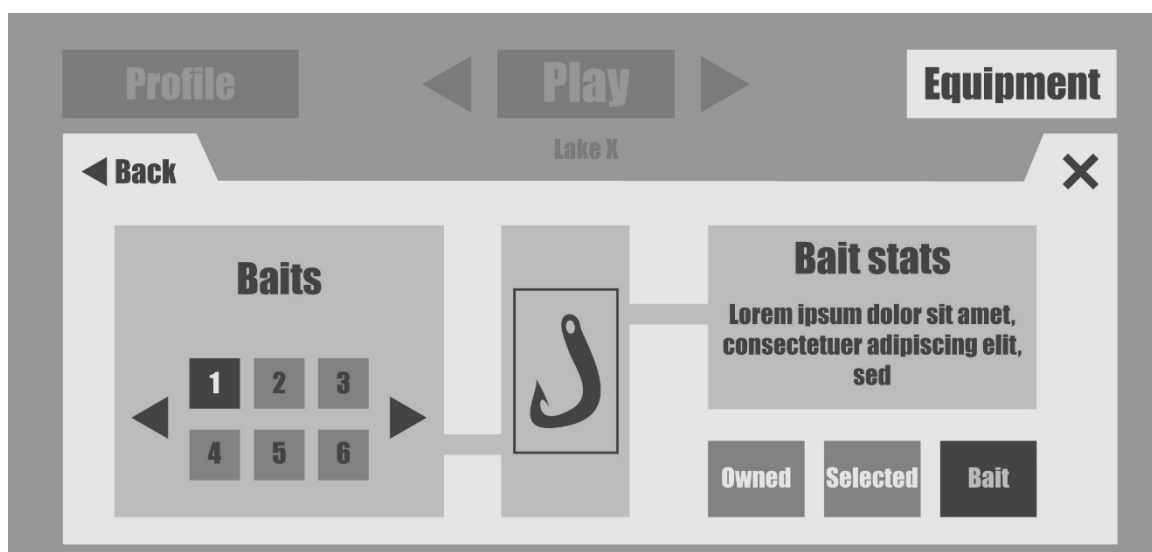
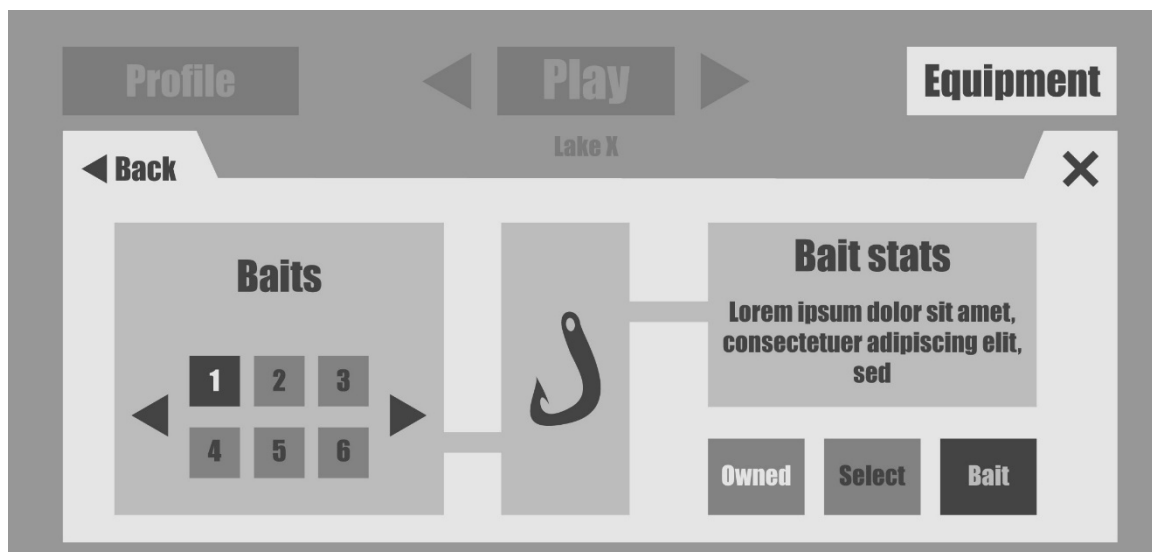
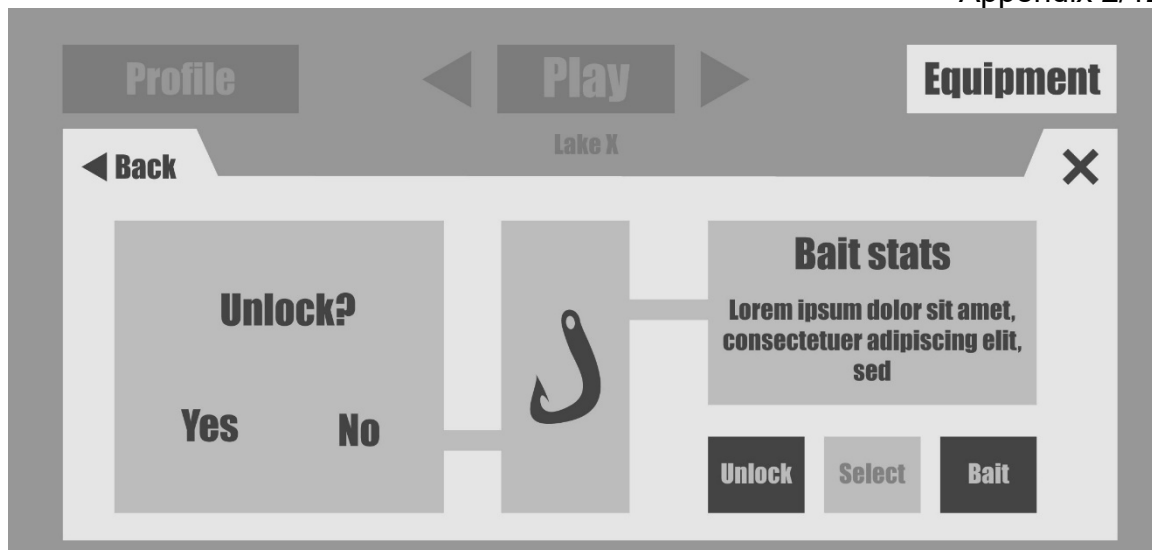












# Fishing game

**Username**

**Password**

New user? Register here!

**Login**



# Fishing game



## Settings

**Music**

**ON**

**OFF**

**SFX**

**ON**

**OFF**

# Fishing game

Welcome to the fishing game Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam

**Tutorial ►**

**Skip ►**

