Enhancing User Engagement in Mobenga's Sportsbook

ChiChing Lam and Carl Larsson Danell

mobenga

a Playtech company

Enhancing User Engagement in Mobenga's Sportsbook

ChiChing Lam and Carl Larsson Danell

LUNDS UNIVERSITET

Enhancing User Engagement in Mobenga's Sportsbook

Abstract

Online sports betting is a billion-dollar industry with fierce competition to deliver the best possible experience. To be able to withstand the competition from rivals, bookmakers needs to be able to differentiate themselves with innovative and cutting edge solutions that offers a complete user experience.

The goal of this master thesis is to investigate how sportsbook users perceive current betting solutions and based on these results find potential way to increase the sportsbook's user engagement.

In order to achieve these goals, this thesis included an evaluation of the current user experience for one of Mobenga's sportsbooks. This consisted of conducting a cognitive walkthrough and a field study with ten participants taking place in the sportsbooks real context. Furthermore, a user-centered design process, focusing on user engagement, was conducted. The design process was divided into three iterations: one conceptual iteration, one low fidelity prototype iteration and one high fidelity prototype iteration.

The results of this master thesis points to that there are room for improvements in Mobenga's current solution, especially in terms of hedonics since the usability was on a very good level. In addition, the results indicate that a smart and clean introduction of new and more engaging features could increase the overall user engagement of a sportsbook without interfering with already existing functionality.

Keywords: user engagement, user experience, user-centered design, sportsbook, sports betting

Sammanfattning

Online-sportspel är idag en miljardindustri med mycket hård konkurrens för att leverera en så bra upplevelse som möjligt. För att kunna stå emot den hårda konkurrensen från konkurrenter måste dagens bookmakers kunna differentiera sig med innovativa och banbrytande lösningar som erbjuder en komplett användarupplevelse.

Målet med denna masteruppsats är att undersöka hur sportsbettinganvändare uppfattar nuvarande spellösningar och baserat på dessa resultat hitta sätt att förbättra en spelplattforms användarengagemang.

För att uppnå dessa mål, innehåller denna masteruppsats en kognitiv genomgång och en fältstudie, med tio deltagare som ägde rum i applikationens riktiga omgivning. Masteruppsatsen innehåller även en användarcentrerad designprocess, med fokus på användarengagemang. Designprocessen var indelad i tre olika iterationer: en konceptualiseringsfas, en låg noggrannhetsprototypfas och en hög noggrannhetsprototypfas.

Resultaten av denna masteruppsats pekar på att det finns utrymme för förbättringar i Mobengas nuvarande lösning, särskilt inom de hedoniska dimensionerna eftersom användbarheten redan höll en mycket hög nivå. Dessutom tyder resultaten på att en smart och stilren introduktion av nya och mer engagerande funktioner kan öka det totala användarengagemanget, för en sportsspelsplattform, utan att påverka redan befintlig funktionalitet negativt.

Nyckelord: användarengagemang, användarupplevelse, användar-centrerad design, sportsbook, sportspel

Acknowledgments

Table of contents

1 Introduction

This master thesis has been completed for the Department of Design Sciences at Lund University in collaboration with the company Mobenga. The first chapter will introduce the background, purpose and scope.

1.1 Sports Betting

It was not long ago that sports betting only was possible on the major sports and included going down to the local bookmaker to place a bet. Much have changed since then, present-day sports betting is available on a wider range of sports, on more events and in multiple formats. One of the main reasons behind the evolution is the rapid advancements of technology that have made sports betting a lot more accessible through mobiles and tablets (EGBA, 2013).

Currently, sports betting is a billion-dollar industry with strong competition to deliver the best possible experience. To be able to withstand the competition from rivals, bookmakers needs to be able to differentiate themselves with innovative and cutting edge solutions that offers a complete user experience.

1.2 In-play Betting

In recent years in-play betting, also known as live betting, has become a swiftly growing trend within sports betting. In-play betting allows the players to bet on various markets for the duration of a match. *The team who receives the next yellow card* or *The next goal scorer* are two examples of in-play bets that could be submitted during a football match. These kind of bets can be placed in many various forms and the odds are constantly updated in regards to the progress of the ongoing sports event.

Moreover, the rise of in-play betting has fundamentally changed the behavior of bettors. Previously, the bets were based on pre-game information but the focus has now shifted to the more thrilling and entertaining live bets. In consequence, Bet365, one of the world's leading gambling groups, reported that the in-play wagers

accounted for 75% of the total sports betting turnover in 2015 (I Gaming Business, 2015).

1.3 Mobenga

Mobenga is a company who has been supplying sports betting solutions to a range of gaming operators since 2005 (Mobenga, 2016). Currently Mobenga is a subsidiary of Playtech Limited, the largest gambling software development company traded on the London stock exchange. For their major partners Mobenga builds bespoke products to suit the needs of each individual gaming operator. Some of Mobenga's current gaming operating partners are Ladbrokes, William Hill and Coral.

In recent years, Mobenga has applied a multi-platform strategy which includes solutions that cover all web and native platforms. Furthermore, Mobenga always values a fast time to market in order to keep their solution up-to-date with the latest technology and quickly be able to introduce new features.

1.4 Ladbrokes

Ladbrokes, one of Mobenga's gaming operating partners, is among the world's leading gambling companies (Ladbrokes, 2016). They offer large amounts of betting and gambling services via its retail, digital and mobile operations. In recent times, Ladbrokes has invested to better serve the needs of their digital customers. To achieve this, Ladbrokes continually cooperates with Mobenga to improve their sportsbook and meet the demands of their customers.

1.4.1 Ladbrokes Life

In 2014 Ladbrokes launched a new advertisement campaign aimed at men aged 18-34. The campaign focused on five different betting characteristics, each represented by a unique persona based on real user behavior. The campaign features The Professor who represents knowledge, The Gut Truster who represents instinct, The Believer who represents bravery, Mr. Brightside who represents optimism, and Generous John who represents generosity (Ladbrokes Life, 2014).

1.5 Purpose

Mobenga always wants to provide the best possible solution for their end users and as a consequence user experience has always been of great concern. In order to provide a continual improvement of the user experience, Mobenga wants to evaluate the current in-play solution in the mobile version of the Ladbrokes sportsbook. Additionally, they want to investigate if the development of new designs and concepts could help to enhance the user engagement in regards to live football events.

Therefore, the purpose of this master thesis is to first evaluate Ladbrokes' in-play solution in regards to football events and thereafter find new ways to improve the user engagement. In order to successfully find and investigate the issues raised this thesis aims to answer the following research questions:

R1: What are the current usability limitations of in-play football betting while using Ladbrokes' sportsbook?

R2: How are the users perceiving Ladbrokes' current in-play football betting experience?

R3: How could the user engagement in a sportsbook be enhanced?

   a. How can user disengagement be prevented during a game or within a short window of time, for example an afternoon?
   b. How to make the user reengage the application during a game or within a short window of time?
   c. How to make the user reengage the application after a certain period, for example the day after or the week after?

1.6 Scope

The scope of this master thesis had a few limitations. Firstly, due to geographical restrictions Ladbrokes streaming services were not available in Sweden and consequently, the authors did not have any access to it. Therefore, the streaming has not been mentioned in the product description or discussed as a part of any alternative solution.

Secondly, the response time of Ladbrokes application could not be affected when conducting the field study. However, it might have impacted the overall impression of the product evaluation.

Finally, the authors had no opportunity to impact the marketing, odds and promotions offered by a gaming operator. Nonetheless, these aspects are also very

important in regards to user experience and user engagement but have been excluded from this master thesis.

2 Theory

This chapter describes the theoretical background that is used as the foundation for this project.

2.1 User-centered Design

The design process user-centered design (UCD) was first introduced by Norman and Draper in 1986. They defined user-centered design as *"[...] user-centered design emphasizes that the purpose of the system is to serve the user, not to use a specific technology, not to be an elegant piece of programming. The needs of the users should dominate the design of the interface, and the needs of the interface should dominate the design of the rest of the system."* (Norman & Draper, 1986).

Over the years more definitions have been proposed containing some deviations from the original one, e.g. Karat: *"For me, UCD is an iterative process whose goal is the development of usable systems, achieved through involvement of potential users of a system in system design."* (Karat, 1997). The multiple attempts at defining UCD mean that it is quite a broad term and has various meanings in different contexts. The definition of UCD has however been compressed into three main principles by Jeff Rubin and Dana Chisnell.

1. Early focus on users and their tasks
2. Evaluation and measurement of product usage
3. Iterated design

The early focus on users and their tasks involves direct communication between the users and designers, but also emphasizes the need for a structured approach when gathering information about and from users. Evaluations and measurements of the product should be performed throughout the design process, for instance prototypes should be tested with actual users. Furthermore, the design process should be performed in iterations which means that the product should be designed, tested and updated regularly. In addition, it is important that testing of conceptual models and prototypes is done early and not just in the final stage of the design process in order to, after each iteration, reshape the prototype based on the obtained feedback (Rubin & Chisnell, 2008).

2.2 Usability

Usability is a wide concept and therefore has numerous definitions. The International Organization for Standardization defines usability with ISO 9241-11 as *"The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use"* (ISO, 1998). This definition captures the most essential factors of usability which needs to be taken into account when evaluating and specifying usability.

Whitney Quesenbery utilizes the definition of usability from ISO 9241-11 as a foundation and for her own definition of usability. To better describe the term, she expands the three characteristics of usability from ISO 9241 by adding two other dimensions, error tolerance and ease of learning. In addition, she replaced the characteristic *satisfaction* with *engaging* and ended up with the five dimensions: Effective, Efficient, Engaging, Error Tolerant and Easy to Learn.

Effective is defined as the completeness and accuracy of which the users achieve their goals. *Efficient* is described as the speed (with accuracy) of which the users can complete their tasks. *Engaging* is explained as to which degree an interface is pleasant, satisfying or interesting to use. It can also be defined as the capability of an interface to draw a user into a site or as the quality of the interaction. *Error tolerant* is defined as how well the product prevents errors and helps the users with recovery from those that do occur. Finally, *easy to learn* is defined as how well the product supports both initial orientation and deepened learning (Quesenbery, 2003).

Jakob Nielsen defines usability as a quality attribute that evaluates how easy and pleasant user interfaces are to use. According to Nielsen, usability also refers to methods for improving ease of use throughout the design process. Moreover, Nielsen suggests five quality components to define a usable product: Learnability, Efficiency, Memorability, Errors and Satisfaction. *Learnability* describes how easy it is for users to complete a basic task the first time they confront the design. *Efficiency* defines how speedily the users can perform a task once they have learned the design. *Memorability* describes how effortlessly the user can reestablish proficiency when they get back to the design after a period of time not using it. *Errors* defines the number of errors the users make, how serious theses errors are and additionally, how easily the users recover from errors. *Satisfaction* describes how pleasant and enjoyable the user experience that the design is (Nielsen, 1993).

2.3 User Experience

User experience (UX) can be seen as an extension of the words human interface and usability. The term covers all aspects of a user's encounter when interacting with a system. Donald Norman, who coined the term in cooperation with Jakob Nielsen,

defines user experience in the following way: *"True user experience goes far beyond giving customers what they say they want, or providing checklist features. In order to achieve high-quality user experience in a company's offerings there must be a seamless merging of the services of multiple disciplines, including engineering, marketing, graphical and industrial design, and interface design"* (Norman & Nielsen, 2016).

Since the first definition, UX has been associated with many different meanings. In 2006 the article "*User experience - a research agenda*", by Hassenzahl and Tractinsky, tried to solve this issue by presenting an overview describing the perceived meaning of user experience. Theirs paper concludes that the user experience is dependent on three different elements: the system, the users and the context of use. In addition, they summarize their research by defining user experience as: *"User experience is a consequence of a user's internal state (predispositions, expectations, needs, motivation, mood, etc.), the characteristics of the designed system (e.g. complexity, purpose, usability, functionality, etc.) and the context (or the environment) within which the interaction occurs (e.g. organizational/social setting, meaningfulness of the activity, voluntariness of use, etc.)"* (Hassenzahl & Tractinsky, 2006).

Furthermore, another attempt at defining UX has been made by The International Organization for Standardization. They defined UX in ISO 9241-210 as *"A person's perceptions and responses that result from the use and/or anticipated use of a product, system or service."* Moreover, the ISO standard states that "*UX includes all users' emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviors and accomplishments that occur before, during and after use".* The standard also states that "*UX is a consequence of brand image, presentation, functionality, system performance, interactive behavior and assistive capabilities of the interactive system, the user's internal and physical state resulting from prior experiences, attitudes, skills and personality, and the context of use"* (ISO, 2009).

2.4 User Engagement

User engagement is one of the most important concepts when designing for user-centered systems. In the literature there are several varying definitions of user engagement. S. Attfield et al. defines user engagement as "*[...] the emotional, cognitive and behavioral connection that exists, at any point in time and possibly over time, between a user and a resource.*" (Attfield et al., 2011). This definition is purposely left quite broad to emphasize that engagement is not a matter of a single interaction but instead about the relationship between technology and user.

O'Brien and Toms, on the other hand, gives a more detailed definition that follows "*Engagement is a quality of user experiences with technology that is characterized by challenge, aesthetic and sensory appeal, feedback, novelty, interactivity,*

perceived control and time, awareness, motivation, interest, and affect." Moreover, to further explain the concept of user engagement O'Brien and Toms have developed *the process of engagement*. They divide the engagement process into four stages: point of engagement, period of engagement, disengagement, and reengagement.

Point of engagement is how and why the user initiates interaction and starts a user experience, these points can be seen as elements that capture the user's attention. Reasons for initiating the interaction are aesthetics, good representation of information, social reasons or if the user is trying to accomplish a specific goal.

Period of engagement is defined as how the user's interest is retained during interaction. This can be achieved by good presentation of feedback, the use of novel information or interesting features. In addition, the users would like to stay in charge of the interaction and face an appropriate challenge level.

Disengagement is explained as the point when a user intentionally stops the interaction or when external factors caused them to abort it. In order to improve engagement, disengagement should of course be avoided as much as possible. Some factors that could cause disengagement are usability issues, lack of novelty, interruptions or lost interest.

Reengagement is defined as the likelihood of returning to the system. This can be specified in either long- or short terms. Factors that offer improved reengagement are a positive past experience, good and useful content, convenience, domain interest and also the curiosity of what has happened in the user's absence.

In addition to the four stages O'Brien and Toms also define *non-engagement*. This occurs when engagement is not a part of the user experience. The factors of non-engagement are fairly similar to the ones of disengagement and include usability issues, preferences, interruptions or content overload (O'Brien & Toms, 2008).

Another approach to define user engagement was made by Nir Eyal in *"Hooked: How to build habit-forming products",* where he introduces a framework which he calls the *Hook Model.* The purpose of the Hook model is to increase user engagement by regularly reengage users without superfluous advertisement or aggressive messaging. To achieve these goals, the hook model aims to create new user habits by following a four phase cycle, see Figure 1 (Eyal, 2014).

Figure 1 The Hook Model (Eyal, 2014).

Trigger is the first phase of the Hook model and can be seen as the motivator of behavior. A trigger can be either internal or external. The external trigger contains the information which tells the users about their next action, this is often made very easy to understand. The external trigger can for instance be a play button in a game, a notification from Facebook or a photo on Instagram. Internal triggers, in contrast, cannot be seen or touched. Instead the internal triggers are bound to the user's emotions and existing routines. Negative emotions are very powerful internal triggers and feelings like boredom, loneliness or frustration often leads to mindless actions, e.g. if a user is bored he checks his Twitter or Facebook feed to find interesting information. In addition, positive emotions also work as internal triggers, e.g. if the user wants to share an accomplishment or other good news.

Furthermore, Eyal states that effective hook transitions move from external to internal triggers *"Effective hooks transition users from relying upon external triggers to cueing mental associations with internal triggers. Users move from states of low engagement to high engagement, from low preference to high preference."*

Succeeding the trigger is the *Action*. The action is the activity the user performs in anticipation of a reward. It can be seen as simple as scrolling a site or searching for information. The Hook model is built upon Fogg's Behavioral Model (Behavior = Motivation + Ability + Trigger), which states that human behavior only occurs when a user has the motivation and the ability to make an action and additionally, that a trigger is present (Fogg, 2009).

Moreover, Fogg has defined three core factors that impacts the motivation for performing an action; *seeking pleasure* and *avoiding pain*; *seeking hope* and *avoiding fear*; *seeking acceptance* and *avoiding rejection*.

Furthermore, the ability is defined as the capability the user has to perform a specific action. Since the ease of use relates to the probability of that the action will occur, Fogg has defined six elements that influences the ease of action. The elements are: time, money, physical effort, brain cycles, social deviance, and non-routine. *Time* is how long it takes to accomplish an action. *Money* is the cost of making an action. *Physical effort* is the the amount of work needed for making the action. *Brain cycles*

9

is the level of mental endeavor and concentration required to take an action. *Social deviance* is how accepted the behavior is by others. *Non-routine* is how much the action matches existing routines.

The third phase of the Hook model is *Variable reward* in which the users are offered a reward for task completion. Eyal defines three various types of rewards that the users can be awarded: Rewards of the tribe, Rewards of the hunt and Rewards of the self. *Rewards of the tribe* is the search for social rewards and validation from others. *Rewards of the hunt* is the search for material resources and information. *Rewards of the self* is the search for underlying rewards of mastery, competence and completion. The purpose of the variable reward step is to satisfy the users in varying ways and keeping them wanting to reengage.

Finally, The *Investment* refers to the anticipation of potential future rewards. Eyal states that *"Investments in a product create preferences because of our tendency to overvalue our work, be consistent with past behaviors and avoid cognitive dissonance"*. According to Eyal, this means that the value of the product increases with the time and effort that the users invest into the product. Investments also enlarge the likelihood of users repeating another hook-cycle by initiating another trigger (Eyal, 2014).

2.4.1 Measure User Engagement

Currently, there are three different ways to measure user engagement, with either self-reported measures, web analytics or physiological measures. Self-reported measures are based on the individual's opinions and attitude towards a product. Web analytics measures user behavior with e.g. site click-depth, time spent on site or user return rate. Physiological measures deal with the relationship between physiological process and behavior and can be measured in the form of e.g. heart rate, brain activity or eye tracking (Lalmas, et al., 2014).

2.5 Cognitive Walkthrough

Cognitive walkthrough is a methodology, established by Polson, Lewis, Rieman and Wharton, for performing usability inspections (Polson et al., 1994). The method focuses on ease of learning and evaluation of user interface designs within the design cycle. The aim of the cognitive walkthrough is to assess the usability of a system and allocate causes to potential usability issues. Cognitive walkthrough requires hands-on simulation of the cognitive activities, from the user's point of view, in order to predict how easy it will be to accomplish a specific task that the system is intended to support. A cognitive walkthrough consists of two phases, the preparatory and the analysis phase.

In the preparatory phase, the evaluators select a set of tasks that the system is intended to support and make explicit assumptions about the user population. For each task, the initial state of the interface and the task description needs to be defined. In addition, a succession of actions used to complete the task and the user's initial goals also need to be decided during preparatory phase. Finally, the definition of the interface should be stated, this is only necessary if the implementation does not represent all information.

During the analysis phase, each action of every task is analyzed in depth. For each action the analyst should ask the following four questions:

1. Will the user try to achieve the right effect?
2. Will the user notice that the correct action is available?
3. Will the user associate the correct action with the effect they are trying to achieve?
4. If the correct action is performed, will the user see that progress is being made toward solution of their task?

These questions are no strict rules and can vary in different contexts. They should instead be seen as more loose guidelines that the analyst should consider while evaluating.

Each action analyzed results in either a success or failure story. The success story defends the credibility of the task success and the failure story gives examples on why the issue was encountered.

2.6 Field Study

A field study is a qualitative evaluation method that is suitable to use in all stages of product development. The method provides a technique for understanding the context of use and its relation to user needs. Moreover, a field study can be seen as an important complement to other evaluation techniques and can provide data that helps the development of product designs.

Furthermore, the field study method is very scalable and adopted widely throughout software design, it is also suitable to use in many different environments. The major advantages of the method are that it offers the ability to bring the user experience closer to the development team and identifies unmet user needs (Wixon et al., 2002). The method also has a few drawbacks, the major one is that the gathered data can be overwhelming which can result in a very time-consuming data analysis.

Before conducting a field study, a preliminary visit of the field is needed in order to gain a general idea about the context, the environment, the users, their tasks and how they relate. Thereafter, the tasks that should be performed by the users, a list of preliminary observable behaviors and potential interview questions should be

decided (Magnusson, et al., 2009). During observation, it is important that the observer takes notes and that leading questions are avoided. The final step of the field study is to analyze the results from the observations and interviews. This should be done immediately after the data collection.

2.7 AttrakDiff

AttrakDiff is a questionnaire designed for evaluating the user experience of a system. The questionnaire was created by Marc Hassenzahl and is based on his model *The hedonic/pragmatic model of user experience*. The model assumes that the interaction between a system and a user goes along two separate dimensions, the pragmatic and the hedonic. The pragmatic quality (PQ) dimension focuses on usability and utility in relation to the user's tasks. In contrast, the hedonic quality (HQ) dimension focuses why the user decides to use a system (Hassenzahl, 2007).

Moreover, AttrakDiff divides the HQ dimension into two different parts: stimulation (HQ-S) and identity (HQ-I). Stimulation indicates to which degree the system offers novel and interesting features and interaction techniques. The identity part covers to what extent the user can identify himself with the system. In addition, AttrakDiff also measures the system's attractiveness (ATT), the global value of the system. Both the pragmatic and hedonic qualities contribute equally to the attractiveness.

Furthermore, the AttrakDiff is designed around a seven-point Likert scale where each of the four dimensions, PQ, HQ-S, HQ-I and ATT, is represented by seven opposite adjective-pairs. Examples of the adjective-pairs are "human-technical" and "isolating -connective" (Hassenzahl, et al., 2003).

2.8 Formative Test

Formative testing (or exploratory testing) is used to investigate preliminary designs early in the development cycle. The early testing is truly important in order to eliminate potential issues that otherwise could remain throughout the entire design process. The test is usually conducted on a prototype or a mockup representing the structure and high level operations of the product. It is not important that all functionality is represented, instead the prototype should focus on the particular goals of the test, e.g. the structure of a menu.

Furthermore, the process of a formative test should be kept quite informal and involve a lot of communication between the test moderator and the participant. The reason for this is that the test is designed to help the developers understand why a user would make an action in a certain way instead of measuring performance. Since

the test is informal the data collected will be mostly qualitative (Rubin & Chisnell, 2008).

2.9 Summative Test

The purpose of a summative test (or assessment test) is to measure or validate the usability of a product. To achieve this, the method seeks to gather quantitative performance data by evaluating how effectively the conceptual model has been implemented. The performance is usually measured by predefined measures such as success rate, time on task or rate of satisfaction.

In contrast to a formative test, this test should be kept more formal and take place in a more controlled environment in order for the measures to remain comparable. The summative test is usually performed on a high fidelity prototype midway or at the end of the development cycle (Rubin & Chisnell, 2008).

3 Work Process

The work process of the project was divided into five phases, see Figure 2. The initial phase focused on gathering information about the product domain and gaining understanding of Ladbrokes' mobile application. In the second phase of the project, an evaluation of both the usability and the user experience of the application was performed.

Based on the results of the evaluation, the third phase was initiated. This phase identified the design concepts that could improve user engagement and carried on to develop them into user stories. These user stories were then evaluated internally at Mobenga in order to focus on the most beneficial concepts.

Moreover, the fourth phase developed the selected concepts into a low-fidelity (lo-fi) prototype and in turn evaluated the design. Based on the results of the evaluation, the design was then improved in high-fidelity (hi-fi) in the fifth phase. Lastly, the final prototype was evaluated.
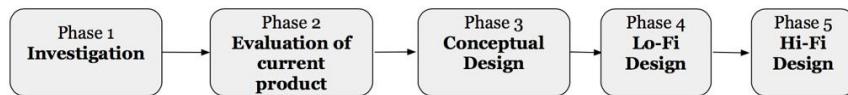

Figure 2 Work process.

The design process of this master thesis was based on the user-centered design principles and techniques, which means that the design process was iterative, had focus on the users and their tasks and that all designs were evaluated.

4 Phase 1 - Investigation

The goal of the investigation phase was to understand how Ladbrokes' mobile application works in its real context and also obtain information about the sports betting domain in which Ladbrokes operates. In order to do that, a mapping of Ladbrokes' mobile sportsbook, a pre-study and a competitor analysis were conducted. This chapter describes the methods used and their results.

4.1 Mapping of Ladbrokes' Mobile Sportsbook

In order to fully understand the current application, a mapping of Ladbrokes' current mobile sportsbook was conducted.

4.1.1 Method

Firstly, all features related to the project scope was identified and their structure was represented in a site-map. Secondly, a more detailed investigation of the overall navigation and all features on the football section was performed.

4.1.2 Results

The main navigation of the application consists of a side-menu and a toolbar, see Figure 3. These elements allow the user to navigate between all parts of the application, e.g. select a specific sport in the A-Z menu, deposit money or go to account settings. The detailed structure and navigation of the application is represented by a site-map, see Appendix A.

Moreover, the navigation of the football section consists of four tabs: Now & next, highlights, coupons and competitions. *Now & next* displays the events that are currently in-play and also upcoming events. The *highlights* tab displays the most popular array of events to make them more accessible. The *coupons* tab lists pre-made coupon suggestions. Lastly, the *competitions* tab displays a list of different nationalities with subsections for the different leagues.
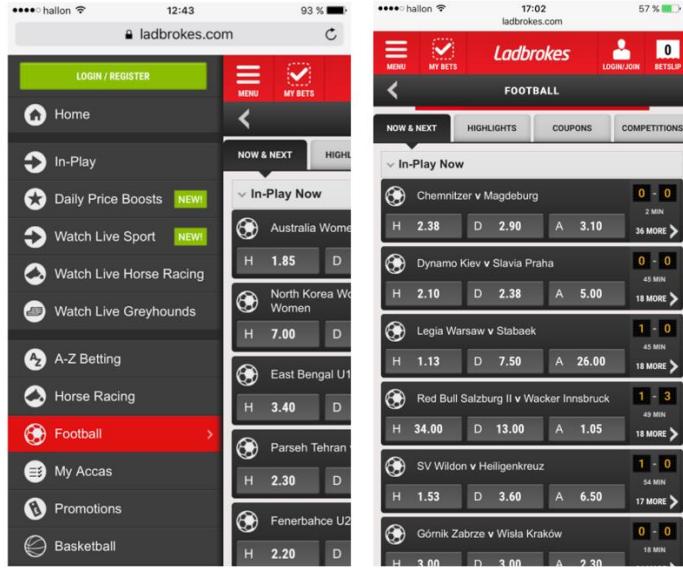
Figure 3 Side-menu to the left and structure of the football section to the right.

Furthermore, it is possible to navigate to an event detail page by clicking an event box from any of the tabs. On the event detail page, betting markets are listed and if the event is available for streaming an additional "watch" icon is displayed in the top right corner. In contrast, if the event is in-play, additional information is displayed on top of the event page. See Figure 4 for a comparison between an in-play and an upcoming event.
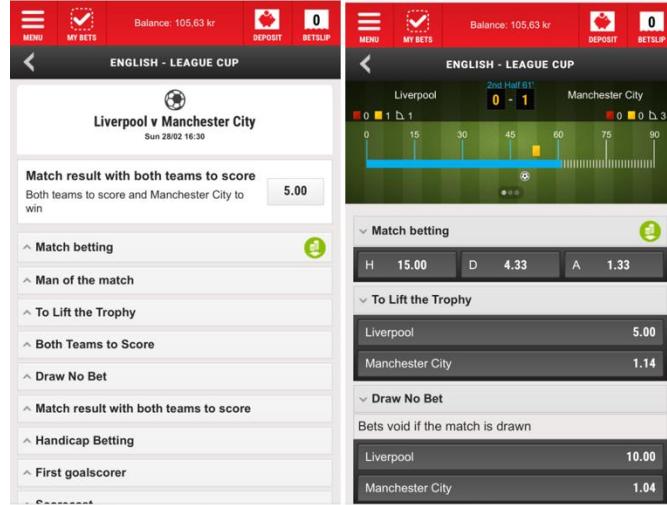

Figure 4 The upcoming event detail to the left, the in-play event detail to the right.

Moreover, on the event detail page of an in-play event it is possible to swipe in order to obtain additional information, see Figure 5. The current score is marked as 1, the

amount of cards and corners for each team is marked as 2 and the current match progress is marked as 3. A swipe to the right displays the in-play statistics, marked as 4, and an additional swipe generates the live match visualization, marked as 5.
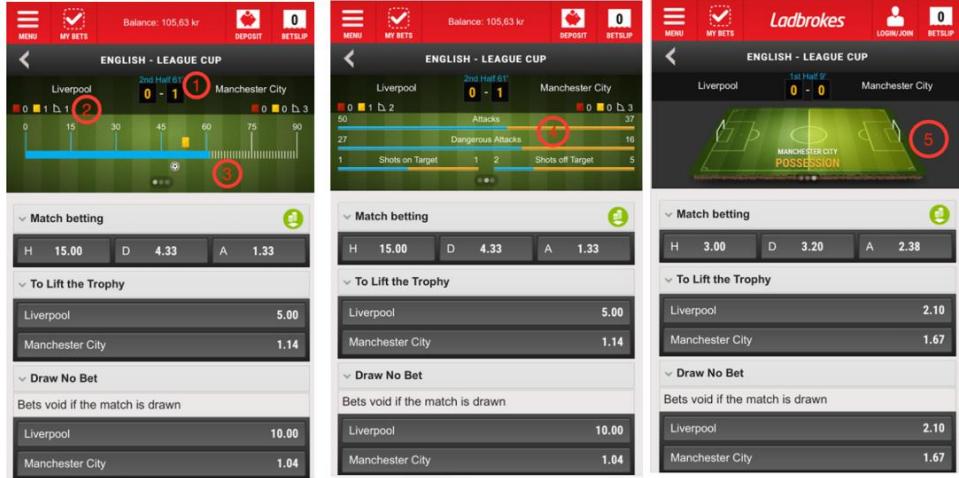

Figure 5 The additional information of an in-play event.

Furthermore, users can either use the *quick bet* or the *add to slip* feature to place a bet. The quick bet box is displayed when the user presses a single odds, see Figure 6. The users can then enter the amount that they wish to wager and then click the *place bet* button, marked as 2. If the users want to play several single bets on different markets, the add to slip function can be used, marked as 1. Additionally, it is possible to turn off the quick bet feature and only use the betslip functionality instead.
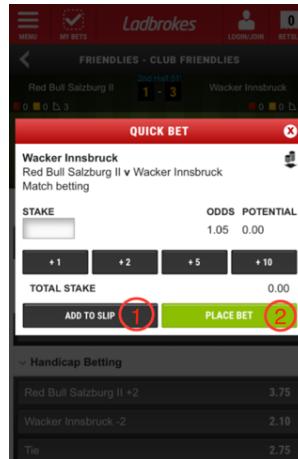

Figure 6 The quick bet feature.

Once the selected markets had been added to the slip they can be found on the *betslip*, see Figure 7. The betslip contains a list of the chosen selections for each betting

market. When the betslip list contains more than one selection, each selection would automatically have the *Include in Multiple* option ticked, marked as 1.

Additionally, the betslip displays a multiples section, marked as 2, which listed different types of multiple bets, also called accumulator bets. The accumulator bets are only available if at least two selections have been made. Depending on how many selections that have been made, a varying number of accumulator bets will be available, e.g. for three selections the available accumulator bets would be *Double*, marked as 3, and *Treble*, marked as 4. A Double is a bet based on two selections and a *Treble* is based on three selections. In order to gain return on a multiple bet all selections must win.
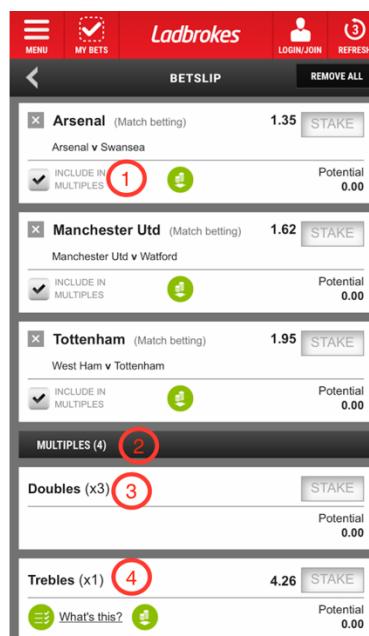

Figure 7 The betslip.

Furthermore, once the bets have been successfully placed, the information about the placed bets are displayed in *my bets, bet history or my acca*. My bets contains two tabs, *open bets* and *settled bets* and the information displayed for each bet is e.g. the market title, the stake, the potential winnings and the odds. Moreover, supplementary bet information can be found in bet history, e.g. the bet receipt id number for each placed bet, see Figure 8.

Figure 8 My bets to the left and bet history to the right.

If the placed bet is an accumulator bet, the user can use the my acca feature, instead of my bets, to live track the current scores, the in-play status and the final results. In addition, it is possible, for some markets, to use the *cash out* feature directly from my bets, bet history or my acca. This feature allows the user to cash out bets before the end of the match in order to e.g. eliminate the risk of a last minute goal, see Figure 9.


Figure 9 My acca to the left and the cash out feature to the right.

The coupons tab simplifies the process of placing accumulator bets. Here, Ladbrokes offers premade suggestions for multiple types of bets. Each coupon has a drop-down menu next to the headline, this drop-down menu allows the user to change between markets for the selected coupon. In order to easily place bets directly from the coupon, a bottom bar is displayed once one or more odds have been selected. The bottom bar displays the total odds, the number of selected odds and a *Set Stake* button, it updates once additional selections are made, see Figure 10.
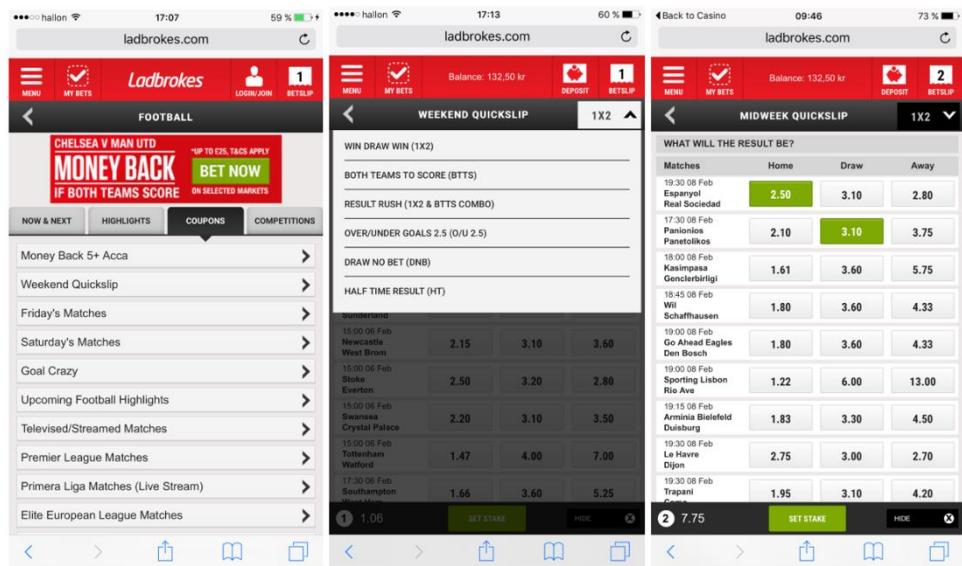

Figure 10 The coupon tab to the left, the drop-down menu in the middle and the bottom bar to the right.

4.2 Pre-study

To better understand the application's context of use, a pre-study was conducted. The pre-study was carried out with three people, two of which are the authors of this paper, during a live football match.

4.2.1 Method

Participant number one had some previous knowledge of sports betting but had never used Ladbrokes before. Participants two and three had very little experience of sports betting in general and had never used Ladbrokes before. In order to document the results of the study, notes were taken throughout the match and the

impressions of the user experience was summarized during halftime and after the game had finished.

4.2.2 Results

The betting experience started with all three participants downloading Ladbrokes' mobile application and registering an account. Once the registration was completed, participant two and three carried on by depositing money before they started to explore the application. However, the experienced participant checked if Ladbrokes offered any promotions, without success, before he deposited money.

Moreover, all participants navigated to the football category since they were about to watch a football match, Manchester City vs Everton in the Capital One Cup, 27th January 2016. This match was predefined to watch due to its accessibility through the service Viaplay, the biggest online sports streaming provider in Sweden. Thereafter, they quite easily found the game at the now & next tab, which was the first tab that appeared after navigation to the football section, see Figure 3. Before the game started the three participants placed a few bets to their own liking. However, they used different approaches to place their bets. The experienced participant started out by checking different markets, but in addition he gathered some statistics like the teams' recent form and their best goal scorers. This information was gathered from a third party source and was used to better motivate the bets. Participant two and three took a more spontaneous approach and placed bets on markets that they understood and that seemed fun, e.g. number of goals or correct score. All participants only placed single bets each time and did not notice the function add to slip, a feature that makes it possible to choose several markets at the same time. After the bets were placed, all participants checked their bets on my bets list.

Once the match commenced, all participants were concentrated on watching the game on a larger screen. However, they all always had their mobiles close by. The experienced participant looked at his mobile about every other 10 minutes during the match in order to see how the odds had changed. Participant two looked at her phone more often to check event details, e.g. number of corners or cards. She also regularly went back to my bets to see the potential winnings. All participants placed additional in-play bets on several markets depending on how the match progressed. To increase the action, bets that would be likely to end soon was used by all participants with much enjoyment, e.g. if any team would score within 15, 30 or 60 minutes.

Finally, after the game had finished, the participants once again went to my bets to check the results of the placed bets. All participants thought that the overall experience was good and exciting. However, participant two would have appreciated a description for every market on the event detail page, to fully understand what each market meant. The experienced participant found it a bit

frustrating that he had to change between the event detail page and my bets to keep track of the ongoing bets.

To conclude, the pre-study gave insight into how the application was used in its natural context. The user behavior could differ depending on both user personalities and previous experience of sports betting in general.

4.3 Competitor Analysis

The purpose of the competitor analysis was to study Ladbrokes' competitors in order to gain understanding of the sports betting domain and current trends in the industry. In addition, the analysis identified the features that Ladbrokes did not offer.

4.3.1 Method

Moreover, the competitor analysis started with a detailed review of all features of Ladbrokes' football section. Ladbrokes' features were then compared with each competitor in order to check if they offered the same functionality. If the competitor had additional features these ones were added to the total list of features to be compared. The analysis was performed on the competitors *Bet365*, *Bwin*, *Betfair* and *Betvictor* since they were suggested by Mobenga and are currently among the world's major gaming operators.

4.3.2 Results

The analysis identified five features that Ladbrokes did not support:

1. *Calendar*: The calendar makes it possible to easily find upcoming matches.
2. *Favorites*: Favorites allow the user to favor a team or market in order to get easier access to the chosen teams' matches or a specific market.
3. *Featured bets*: Featured bets are special bet suggestions that are offered by the gaming operator. These bets are displayed as highlights on the football page.
4. *Search*: Search gives the user the possibility to search for events related to a team or a player.
5. *Additional statistics*: Additional statistics give the user more information about a match, e.g. a team's recent form or top goal scorer.

The total list of features in relation to the chosen gaming operators is summarized in Table 1.

Table 1 The summarize of the competitor analysis. "X" = The feature is supported.

	Ladbrokes	*Bet365*	*Bwin*	*Betfair*	*Betvictor*
In-play	X	X	X	X	X
In-play visualization	X	X		X	X
In-play statistics	X	X	X	X	X
My bets	X	X	X		
Quick bet	X			X	X
Cash out	X	X	X	X	X
Coupons	X	X			
Streaming	X	X		Horse racing & greyhounds	Horse racing
Featured matches	X	On main sport page	X	X	On main sport page
Betslip	X	X	X	X	X
Bet history	X	X		X	X
Calendar			X	X	
Favorites		X	X		
Featured bets	On main sport page		X	On main sport page	X
Search			X		
Additional statistics			For selected matches)	For in-play events	

4.4 Conclusion of the investigation

The preparation phase presented an overview of Ladbrokes' mobile sportsbook structure and features. Furthermore, by acting out the real user experience during a live football match, better understanding of the features, context of use, and also the potential user behaviors were identified.

Moreover, the competitor analysis provided additional knowledge of the product domain and gave insight into which features that already existed on the market.

To summarize, a lot of knowledge regarding the application, the domain and its context of use have been obtained in order to start the evaluation.

5 Phase 2 - Evaluation of Current Product

The purpose of phase two was to evaluate the in-play football betting of Ladbrokes' current mobile solution and to gain understanding on how users perceived the application. This chapter describes the evaluation methods and the results of their usage. Lastly, a conclusion of the results is presented.

5.1 Cognitive Walkthrough

In order to find potential usability issues, that could impair the user experience, a cognitive walkthrough of the application was performed (Polson et al., 1994). The walkthrough was limited to the football section of the application since that was the scope of this thesis.

5.1.1 Method

The evaluation process was divided into two phases, the preparatory and the analysis phase. The goal of the preparatory phase was to answer the following questions:

1. Who will use the system?
2. What tasks will be analyzed?
3. What is the correct action sequence and how is it described?

Moreover, during the analysis phase the walkthrough of all the defined actions was performed. For each action the following questions were answered:

1. Will the user try to achieve the right effect?
2. Will the user notice that the correct action is available?
3. Will the user associate the correct action with the effect they are trying to achieve?
4. If the correct action is performed, will the user see that progress is being made toward solution of their task?

In order to capture critical information, notes of the outcome of each action was documented. A failure story was created for each task that identified an issue and in consequence, the tasks that did not identify any issues produced a success story.

5.1.2 Results

Preparatory phase

The typical user was defined as: A person who is interested in football and in-play betting. The person also has access to a smartphone, previous android/iOS knowledge and a registered Ladbrokes account.

The following tasks were included in the walkthrough:

Task 1: Place a bet on any in-play event, and validate that it has been placed.
Task 2: Place a bet on an upcoming event in Segunda Liga, and validate that it has been placed.
Task 3: Use the bet coupon Goal Crazy and place a treble bet.
Task 4: Place several bets, using the bet slip, on an upcoming event from the premier league.
Task 5: Use the bet coupon English Matches and place several bets on the market Both Team to Score (BTTS).
Task 6: Place a bet on an upcoming event and cash out the stake, then verify the cash out on the settled bets page.

The correct action sequence of each tasks can be found in Appendix C.1.

Analysis Phase

The analysis resulted in the identification of eight unique usability issues. For each issue a failure story was created and in consequence, the tasks that did not include any issues produced a success story.

Furthermore, the usability issues that were found was then categorized into four different categories to get a better understanding of which part of the system that was affected. This resulted in the following four categories:

1. The coupon feature.
2. The design of the event box.
3. The add to slip feature.
4. Betslip visibility.

The coupon feature produced four different issues, with two of them occurring twice. The first issue arose when the user did not realize that multiple bets could not be placed on the same market and still be included in an accumulator bet. This occurred since no clear feedback was given and the missing feedback then resulted in the second issue; that the user could not find the correct action. This issue transpired since the button set stake disappeared once the selected odds conflicted. The third

issue was only encountered once and appeared due to poor visibility of the drop-down menu. Furthermore, the fourth issue occurred since the user did not understand the labeled abbreviations of the drop-down menu, see Figure 10. The cause for this was that the label did not correctly reflect the displayed title.

The design of the event box produced two usability issues, both encountered twice. The first issue occurred since the text "More" was not perceived as a button, see Figure 3. This caused the second issue; that the user tried to click areas of the event box that did not offer any feedback.

Furthermore, the next issue was related to the add to slip feature, see Figure 6. The issue was caused due to poor visibility of the add to slip button, a consequence of that the place bet button was green and stole the user's attention.

The last usability issue was related to the visibility of the betslip, see Figure 7. The issue occurred when the user had selected odds and was about to place bets, instead of pressing betslip the user pressed my bets, see Figure 8.

The complete results of the cognitive walkthrough can be found in Appendix C.2.

5.2 Field Study

The purpose of the field study was to evaluate the application's current user experience for the target audience. Since the live-betting experience is very fast paced and situational it was important to evaluate the user experience in its real context. To address this, the field study was conducted in a natural setting during a live match with one participant at a time.

5.2.1 Method

The participants of the field study were selected to match the personas of the Ladbrokes Life campaign, see section 1.4.1, in order to properly represent Ladbrokes' target group. In total, the field study included 10 participants. All of the selected participants were students at Lund University. Four of them were either classmates or friends and the six remaining participants were unfamiliar people that were recommended by friends. All participants were between the ages 20-30 and were interested in football but had different degree of previous betting experience.

Firstly, each test session began with a briefing session. The briefing was performed to inform the participant about the upcoming test session and included information about which product that should be tested. Additionally, the participants were asked what previous experience they had of sports betting and which gaming operator they had used before. In order to present all participants with the same information, the test leader followed the same orientation script for all tests, see Appendix B.1.

Secondly, once the briefing session was finished, the participant was asked to perform two tasks:

1. Place one or more single live-bets on a single football match.
2. Place at least one football accumulator bet.

For both tasks the participant was told to freely choose which games and markets that he would like to bet on. In order to capture "the true user experience", the tasks were left intentionally open and exploratory behavior was encouraged. In addition, the participant was asked to think-aloud while completing the tasks.

To collect qualitative data about the system's usability and complexity, the participant's behavior and thoughts were observed and documented throughout the test sessions. Additionally, to document the participant's interactions and thoughts, AZ screen recorder (AZ screen recorder, 2015) was used to record both the screen and audio.

Once the tasks were completed, the participant was asked to fill out the AttrakDiff questionnaire. The purpose of using AttrakDiff was to gain quantitative data about the user experience of the application. The AttrakDiff questionnaire that was used can be found in Appendix B.2.

28

Finally, a debriefing session was conducted. The goal of the debriefing was to collect qualitative data regarding the participant's overall emotions towards the application. The questions included were kept open-ended and did not focus on any particular issue or feature to avoid bias. The questions used as a base in the debriefing are listed below:

1. How did you experience Ladbrokes?
2. Which feature did you like the most? Why?
3. Which feature did you dislike the most? Why?
4. If you were given more time, which part/feature would you like to check out/spend more time on?
5. What would you like to have, but did not find in the application?
6. Would you use Ladbrokes again? Why/why not?

5.2.2   Results

The field study resulted in the collection of different types of data, the raw data obtained from the field study can be found in Appendix B.3. To give a clear overview of the results the data was divided into four different categories: background, observational, questionnaire and interview data.

Participant background

The field study included 10 participants whereof 5 were classified as experts, 3 as intermediates and 2 as novices. In the expert group one participant was a Ladbrokes customer and one participant was a previous customer, the additional three participants had plenty of experience in using similar products. The three intermediate participants had some previous experience of using similar applications. The participants classified as novices had little experience of using sports betting applications but had good domain knowledge.

Additionally, before the test commenced the participants were asked to state which gaming operator that they had used before, the results of that question can be seen in Figure 11.
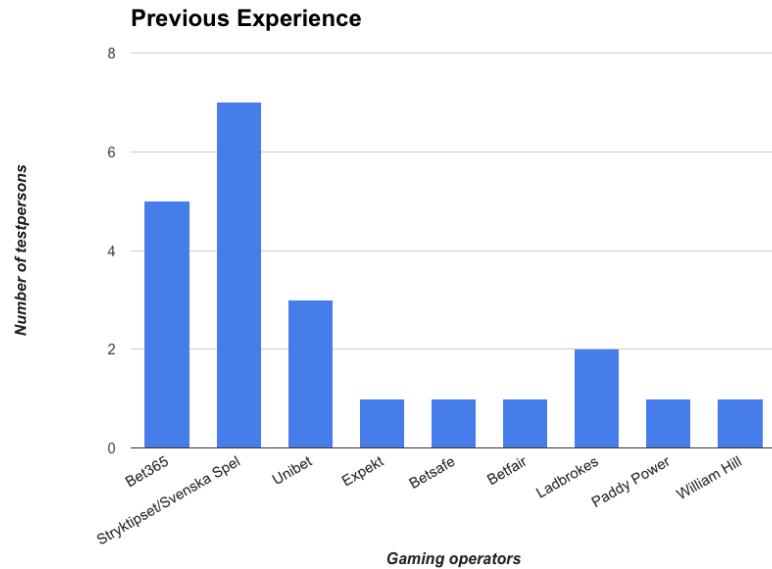
Figure 11 Previous experience of gaming operators.

Observational data

Table 2 specifies in which parts of the application the participants encountered problems, the reason for why they occurred, the number of participants that faced the problem and their expertise level.

Table 2 Problem encounters.

Problem	Expertise level & reason for encountering problem	Number of occurrences
Quick-bet, stake buttons	<u>Expert</u> The user did not understand the buttons since the currency was not displayed.	1
Navigation issues	<u>2 Novice, Intermediate</u> The user did not find a specific game since the competitions tab was too cluttered.	3
Accumulator bets	<u>Novice, Intermediate</u> The user placed multiple single bets instead of an accumulator.	2
	<u>Intermediate</u> The user places both single and accumulator bets.	1
	<u>Novice</u> The user had difficulties understanding how to use add-to-slip.	1

Markets	Intermediate	1
	The user did not find the market he was looking for.	
	Novice	1
	The user did not understand the markets.	
Coupon bottom bar	Novice	1
	The user did not use the bottom bar, he used the betslip instead.	

Questionnaire data

After completing the tasks, each participant was asked to fill out the AttrakDiff questionnaire. The results of the questionnaire are divided into four different dimension: Pragmatic quality (PQ), Hedonic quality Identity (HQ-I) Hedonic quality stimulation (HQ-S) and Attractive (ATT). Figure 12 displays the average value of each dimension.
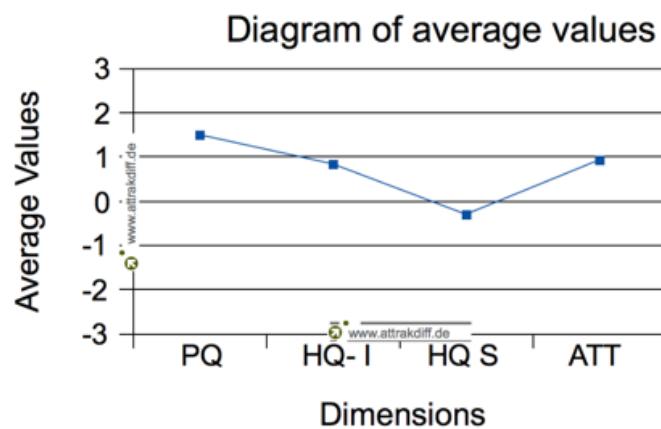
Figure 12 Average values of the AttrakDiff dimensions.

Figure 13 displays the hedonic quality on the vertical axis and the pragmatic quality on the horizontal axis. In regards to the values of the two dimensions, the system has been classified in a so called "character-region". The dark blue, smaller, rectangle indicates the medium value and the light blue, bigger, rectangle displays the confidence area. The confidence rectangle suggests where values would be placed if additional users answered the questionnaire and its size relates to how consistent or variable the answers were.
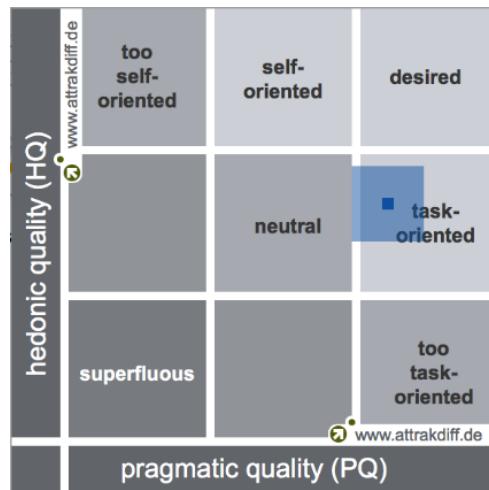
Figure 13 Hedonic and Pragmatic quality matrix.

Figure 14 displays the average value of each individual word-pair. The extreme values are of most interest since they indicate which characteristics that cause a particular risk or benefit.
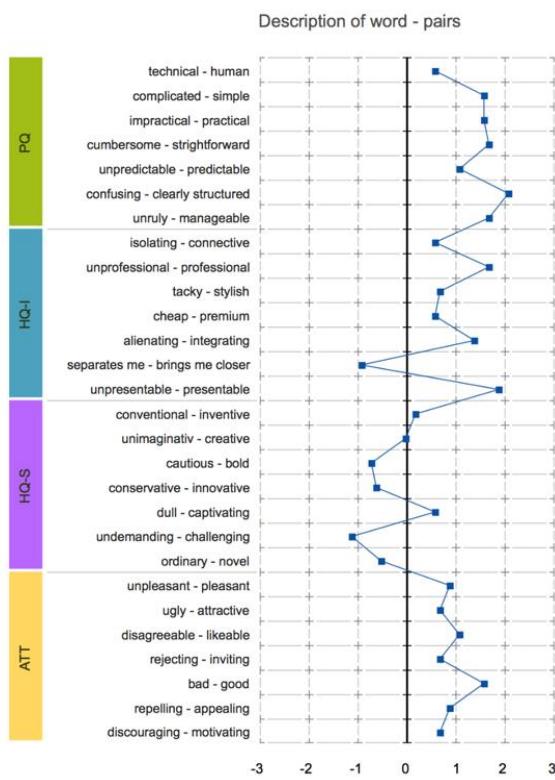

Figure 14 Average value of the AttrakDiff word-pairs.

32

Interview data

The answers of the interviews have been analyzed and critical information was identified for each question. The result of each question is presented below.

Question 1: "How did you experience Ladbrokes?"

The keywords identified from question one have been categorized into three groups: positive, neutral and negative. The results of the categorization and the frequency of the keywords are presented in Table 3.

Table 3 Summary of answers from question number one.

Positive	*Neutral*	*Negative*
Good *(2 answers)*	Standard *(3 answers)*	Too easy
Simple *(4 answers)*		Cumbersome to place accumulator bets *(2 answers)*
Good feedback		Confused by the betslip/quick bet.
Clear structure *(2 answers)*		Should be easier to find competitions *(2 answers)*
Coupon - bottom bar		The interface design was a little boring *(3 answers)*
		Slow
		Not the same amount of markets as Betsafe
		No streaming

Question 2: "Which feature did you like most? Why?"

In total, five participants answered that they did not like any special feature. The answers from the remaining participants are listed below in Table 4.

Table 4 Summary of answers from question number two.

Feature	Reason
Markets	The high amount of different markets on each event detail page.
Quick bet *(2 answers)*	It was very easy to place bets.
Betslip	Very smart feature, similar to shopping basket.
Navigation	It was easy to navigate.
Highlights	No particular reason was given.
Response time	The application was slow, so there was time to think.

Question 3: "Which feature did you dislike the most? Why?"

Four participants answered that they did not dislike any particular feature. The answers from the other participants are presented in Table 5.

Table 5 Summary of answers from question number three.

Feature	Reason
Event box	The event boxes were quite small and messy. It would be better if there was more space between the boxes.
Betslip	Did not like the betslip icon.
Too easy to place bets	The user felt as he was getting tricked.
Statistics	It would be good to have more statistics.
Response time *(2 answers)*	The application was too slow.
Accumulator bets *(2 answers)*	The feature was confusing.

Question 4: "If you were given more time, which part/feature would you like to check out/spend more time on?"

The two participants with the most experience of the application did not have any particular feature that they would like to spend more time on, since they already had great experience in using the application. The remaining participants pointed out that they would like to explore one or more of the following features:

- Coupons (4 answers)
- Markets (3 answers)
- Bets that stretch over a long period of time
- Live betting
- Tips/Offers

Question 5: "What would you like to have, but did not find in the application?"

Four participants did not come up with any features that they missed. The other participants mentioned that it would be nice to have one more of the following features:

- Statistics (2 answers)
- Notifications
- Personalization (2 answers)
- Change amount of standard bet
- Social communication
- Betting tips
- Streaming
- Better navigation
- Search feature: for teams, matches and players.

Question 6: "Would you use Ladbrokes again? Why/why not?"

Five participants answered that they would like to use the application again, three participants said that they might use it again and two participants stated that they would not use the application again. See Figure 15 for the distribution of answers.

The main reason for wanting to reuse the application was that it was very simple to use. Another contributing factor that was pointed out was the amount of marketing and commercials performed by Ladbrokes. The participants that answered maybe stated that they might use the application again after comparing odds and promotions with other gaming operators. Additionally, one participant mentioned that he would start using the application if they added more video content such as highlights and streaming.

Moreover, one of the participants that did not want use the application again motivated his response by stating that the application did not offer streaming and that he thought the navigation was too cumbersome. The other participant that did not want to reuse the application said that he could not be bothered to change gaming operator since Ladbrokes did not offer anything particular.
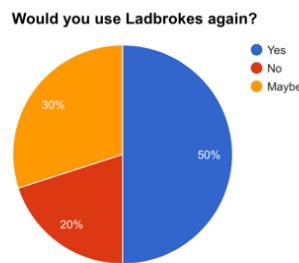
Figure 15 The distribution of answers from question six.

5.3 Conclusion of the Evaluation of Current Product

The evaluation methods provided a lot of valuable feedback on how the current application works in its real context. Firstly, the results indicated that the application was very easy to use, especially for expert users who nearly did not encounter any problems at all. One participant even stated that "the application is too easy to use" which was a perfect answer from Mobenga's standpoint.

Secondly, the results from AttrakDiff suggests that the application was task-oriented. This means that the application lacks in the hedonic dimensions and was not perceived as innovative, novel or connective but offers good usability. These results were also emphasized by the interviews, in which the participants stated that the application was "good", "simple" or "standard".

Thirdly, even though the applications usability was rather good, some usability issues were identified in connection to competitions, coupons, event boxes, event detail page, quick bet and betslip.

Finally, and important to note, was that three of the participants only look at odds and promotions when deciding which sportsbook to use and fifty percent of the participants would like features that was not supported by Ladbrokes.

6 Phase 3 - Conceptual Design

The goal of phase three was to use the conclusions from phase one and two and identify new concepts which focused on improving the application's user engagement.

The phase started with a brainstorming session. As a result of the brainstorming session, a persona and a number of user stories was created. Finally, an evaluation was conducted in collaboration with Mobenga's product team to prioritize the user stories.

6.1 Brainstorming

The goal of the brainstorming session was to come up with new concepts and further develop ideas that were identified during previous phases.

6.1.1 Method

The brainstorming session was based on three simple rules: defer judgment, encourage wild ideas and build on the ideas of others (Quesenbery, 2010) and was conducted by the authors of this paper. Moreover, all ideas that had potential benefit in regards to user engagement was further discussed and categorized. Finally, the benefits in regards to user engagement, according to the definitions stated in section 2.4, was identified for all categories.

6.1.2 Results

The results of the brainstorming sessions are presented in Table 6.

Table 6 Results of the brainstorming session.

Category	Description	Theoretical benefits (O'Brien & Toms)	Theoretical benefits (Eyal)
Social gaming	Refers to online gaming that provides social interactions between players.	*Point of engagement* -Social reasons *Period of engagement* -Interesting features -Appropriate challenge level *Reengagement* -Curiosity of what happened in the user's absence	*Trigger* -Internal *Variable reward* -Rewards of the tribe *Investment*
Social network	Refers to when users can communicate with each other via a social platform. The focus is to maintain a connection between users by facilitating the mechanic of direct communication.	*Point of engagement* -Social reasons *Period of engagement* -Interesting features -Appropriate challenge level *Reengagement* -Curiosity of what happened in the user's absence	*Trigger* -Internal *Action* - Seeking acceptance *Variable reward* -Rewards of the tribe *Investment*
Betting tips	Refers to when users share information regarding a bet. The suggestion can be both single and accumulator bets and submitted by either a normal user or a betting expert.	*Point of engagement* -User trying to achieve a specific goal Period of engagement -User in charge of interaction. -Interesting feature *Reengagement* -Curiosity of what happened in the user's absence	*Trigger* -Internal *Variable rewards* -Rewards of the self -Rewards of the tribe *Investment*
Personalization	It allows a user to customize the user experience in order to better suit his needs.	*Period of engagement* - User in charge of interaction *Reengagement* -Useful content	*Trigger* -External *Variable rewards* -Rewards of the self *Investment*
Gamification	It is the concept of applying game techniques to a non-game application or feature.	*Period of engagement* -Interesting feature -Appropriate challenge level	*Trigger* -External *Variable rewards* -Rewards of the self -Rewards of the tribe

Notifications	It is a pushed message that gives the user relevant information regarding various events.	*Period of engagement* -Presentation of feedback *Reengagement* -Curiosity of what happened in the user's absence	*Trigger* -External
Additional statistics	Detailed statistics regarding e.g. a team's recent form. The data gives the user additional information and a better base for analysis.	*Point of engagement* -User trying to achieve a specific goal *Period of engagement* -Interesting feature *Reengagement* -Useful content	*Trigger* -External *Variable rewards* -Rewards of hunt
Alternative interactions	Interactions that does not involve the standard clicking of buttons, e.g. voice-control or gesture-based interaction.	*Reengagement* -Convenience	*Trigger* -External

6.2 Persona
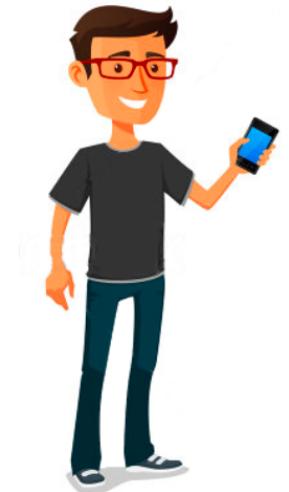
In order to represent the end-users point of view when creating the user stories, a persona was created.

6.2.1 Method

The development of the persona was based on the Ladbrokes Life campaign, see section 1.4.1.

6.2.2 Results

The finished persona can be seen in Figure 16.

John Ramsey is a single 28 year-old man that is working as a construction worker. He is a sociable and positive guy that is always up for a night with the boys.

One could say that John's passion in life is football. He watches all of Arsenal's matches, either with his friends or alone depending on the game times. John also tries to watch as many other matches as possible from all of the European top leagues, and to add some excitement he usually places a few bets. Sometimes randomly and just for fun and sometimes he does a bit of research before placing a complex accumulator.

John also plays lower league football matches with his friends every Sunday. They are aiming for a title this year, even if it is not very likely.

Figure 16 Persona.

6.3 User Stories

The reason for creating user stories was to concretize the concepts that were identified during the brainstorming session into high level requirements.

6.3.1 Method

Firstly, the eight categories from the brainstorming session were used as a foundation for the user stories. Secondly, each category was discussed in regards to what the persona could want or need in order to accomplish different sports betting tasks in realistic situations. Thirdly, at least one user story was created for each category.

Furthermore, the user stories focused on the persona's activity, actions and behavior in a specific context (Quesenbery & Brooks, 2010). Moreover, the motivation that trigger the persona's actions and the outcome of those actions were also described in the user stories. In order to not limit the stories, the technical details were not considered.

6.3.2 Results

Social gaming

The Challenge

A lot of friends support different teams and have various opinions about football. When John watches a game with his friends, they usually argue about which team that will win. John kept thinking about all those times his game predictions came true but did not get a dime for it. However, this time he wagered one of his friends and doubled his money.

The Share

John and one of his friends are watching a lot of football games together. Last time, they both realized that Alexis Sanchez most probably would score a hat trick since he seemed to be on fire. They both decided to place the bet and to simplify the process John shared his betslip. After the game, John and his friend celebrated their winnings.

The Inspiration

Last night John was home alone and was feeling quite bored. He was wondering if any of his friends have placed any interesting bets. In order to check, he took out his smartphone and opened his sports betting application. One bet looked very promising, so John decided to place the same bet.

The League

John and his friends are always competing for everything. This time they have started a betting league in order to see who really is the best gambler for the upcoming season. A lot of honor is at stake!

Social network

The Scribble Wall

Sometimes John is just staying at home and tracks on-going games with his smartphone. In order to see if there are any interesting bets that could be placed, he usually checks the scribble wall to get a general impression of what is going on.

Bragging Rights

Yesterday John won a sevenfold accumulator. Today he is feeling really proud and would like to share the results with his social network. Of course the sharing of the results produced a lot of likes.

The Invitation

Not many of John's friends are using the same gaming operator as him. However, John thought that it would be nice if they could use the same operator, so he invites his friends to the one that he is using. John's friends do not have to know about the rewards that John claimed for doing so.

Betting tips

The Tips

John wants to learn from the professionals in order to become a better gambler. Last week he read up on the most popular betting tips on his smartphone before placing any bets. He was extremely happy that the tips helped him to double his winnings.

Share Tips

Recently John has been on a winning streak, winning ten accumulators in a row. In order to establish himself as one of the top gamblers of the site he decided to start publishing his upcoming accumulators as tips. A lot of followers and likes to come…

Personalization

The Favorites

John is a big fan of Arsenal. In order to have easier access to information regarding Arsenal he has decided to put them on his favorite list. He is also very interested in *Primeira Liga* so he also decided to put that entire league on his favorite list.

Gamification

The Poll

Yesterday John was watching the game Arsenal vs Everton. During the game, the referee gave a red card to one of Arsenals players and John strongly disagreed with the decision. He was feeling very irritated and wanted to see how the other people reacted to the decision. At least there was one good thing, 87% of the people on Ladbrokes were of the same opinion as him.

The Quiz

During the break of the match between Arsenal and Everton, John was feeling a little bit bored and wanted to find something to do. He took out his smartphone in which he could answer some questions that were connected to the match. Of course John answered most of them correctly but he actually missed the first two minutes of the second half.

Notifications

In-Play Notifications

John was interested in a few matches in the Premier League last night. In order to follow the progress of these matches, he received notifications from all games whenever something interesting happened. By receiving them, he always knew exactly what was going on.

Bet Notifications

It is game day and John has placed more than ten bets on various markets on the match between Arsenal and Everton. In addition, he also placed some bets on the Manchester United vs Liverpool and Chelsea vs Leicester games. John's attention was focused on the Arsenal game but he kept track of his other ongoing bets by checking his notifications.

Additional stats

The Stats

Tonight Manchester United are facing Liverpool. In order to place better bets and potentially win more money, John wants to investigate the teams' statistics before placing any bets.

Alternative interaction methods

The Chips

It is a Saturday afternoon and John was watching the game Arsenal vs Leicester. He loves to eat chips and drink a few beers while watching matches. The match had been going on for 25 minutes and Arsenal's performance was quite good and they had a number of dangerous attacks. John felt by instinct that Arsenal were about to get the first goal. He wanted to place a bet but he was holding chips in both of his hands so he had to run to the kitchen and wash them quickly. Unfortunately, Arsenal scored before he came back and he missed his chance.

6.4 Story Prioritization

In order to identify the most beneficial user stories, a story prioritization was conducted.

6.4.1 Method

Firstly, the stories were prioritized in ordinal scale by a Mobenga employee. Secondly, personal favorite stories were selected by the Mobenga employee and the authors of this thesis.

To conduct the prioritization all story titles were written down on post-it notes, one color representing one category. The post-it notes were then placed on a whiteboard in Mobenga's preferred ranking. Mobenga based their prioritization purely on potential business value and the ease of integrating the feature.

Once the ordinal scale prioritization was completed each participant was asked to select at most five favorite stories. The selection was made by marking stories with a unique color.

6.4.2 Results

The results of the prioritization in ordinal scale are presented in Table 7, ranking 1 has the highest priority and 7 has the lowest. Additionally, some stories are considered to have the same priority. All stories that received the lowest priority are already specified by Mobenga which means that they are all great concepts but they have already been conceptualized and are under development.

Table 7 The result of ordinal scale prioritization.

Ranking	User stories			
1	The Inspiration			
2	The Challenge	The Share		
3	The League	The Quiz	The Poll	
4	Bragging Rights	Share Tips		
5	The Invitation			
6	The Scribble Wall	The Tips	The Chips	
7	The Favorites	In-play Notification	Bet Notifications	The Stats

The results of the favorite selections are presented in Figure 17. The green color represents Mobenga's opinion, the red and black colors represents the opinions of the authors of this thesis. Furthermore, a discussion was held together with Mobenga in order to ensure that the further development of the user stories could bring additional business value. In addition, it was very important to take the theoretical aspects of user engagement into account.

Figure 17 Favorite marking.

6.5 Conclusion of the Conceptual Design

The story prioritization decided which stories that should be further developed and which ones that should be discarded.

Firstly, the stories that were already conceptualized by Mobenga was discarded to keep the focus of the project on new and more beneficial ideas.

Secondly, all stories that received a prioritization ranking worse than three was also discarded.

Finally, the share and the inspiration was discarded since those stories did not receive a high enough favorite marking. The stories that remained were the challenge, the league, the poll and the quiz.

7 Phase 4 - Lo-Fi Design

The goal of phase four was to develop the four selected user stories into a lo-fi prototype. Once the prototype was finished, it was evaluated with a formative usability test.

This chapter describes the design process, the usability evaluation and finally concludes the results of this phase.

7.1 Design

The design process was based upon the user centered design process and involved several design workshops. Additionally, potential technical constraints were investigated before developing the lo-fi prototype in order to avoid unrealistic expectations.

7.1.1 Method

Firstly, numerous applications and websites that offer similar features to the selected user stories were studied in order to get better understanding and gather inspiration. Secondly, a sitemap was created to give a clear structure of the new features and the overall navigation. Thirdly, a great number of sketches was drawn and discussed. Finally, once the sketches were confirmed, the development of the paper prototype commenced.

The frame of the prototype was developed using the software Balsamiq Mockups (Balsamiq, 2016) and the additional menus and details were drawn by hand. To ensure that the prototype offered good usability and followed the classic principles of good design, all designs were based on Google Material Design (Google, 2016) and Donald Norman's design principles for usability (Norman, 2002).

7.1.2 Results

Figure 18 displays the main level navigation of the prototype, which consists of a toolbar, two side-menus, and an action button. The toolbar is located on the top and the action button, which will work as the betslip, is located in the bottom right corner, marked as 1. The action button is intended to work as a floating button that elevates above any other contents to always have good visibility.

The left image displays the first side-menu which expands once the menu icon in the toolbar, marked as 2, is clicked. This menu contains a large number of sports that are possible to bet on. As mentioned earlier, this prototype will however only focus on football.

The middle image displays four different tabs, based on Ladbrokes' current sectioning. In Figure 18, the now & next tab is selected. This tab is the starting page of the football section.

The right image displays the side-menu that expands once the account icon, marked as 3, is clicked. This menu contains additional options that are needed in order to make the design of the selected user stories technically possible. Firstly, *Profile* contains the user's information such as username, profile picture and user statistics. Secondly, *Friends* provides the possibility to add other users as friends and also manage the current set of friends. Thirdly, *Leagues* contains information and settings regarding the management of the user's betting leagues. Furthermore, *Notifications* allows the user to receive and read notifications. Finally, *Settings* contains all of the user's account settings, such as payment information and password.
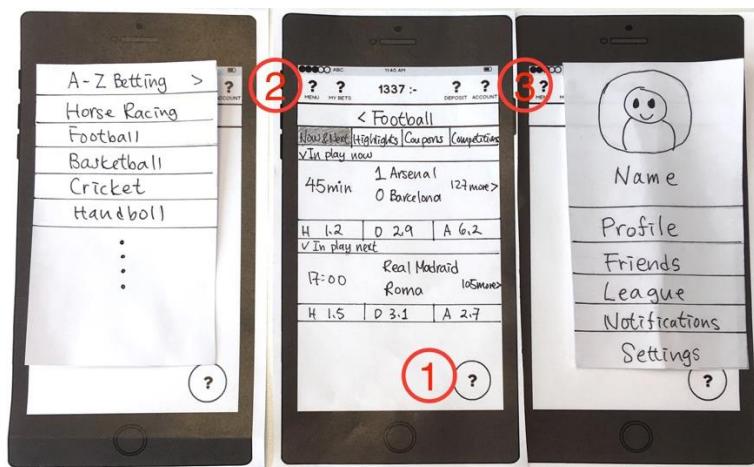
Figure 18 Toolbar and side-menus.

The friends section consists of two tabs: *My Friends* and *Find Friends*, see Figure 19. My friends allows the user to accept or decline friend requests from other users

47

and also lists the user's current friends. Moreover, the find friends tab makes it possible for a user to search for additional friends. If the user is logged in via a Facebook account, the user's Facebook friends will be listed as suggestions.
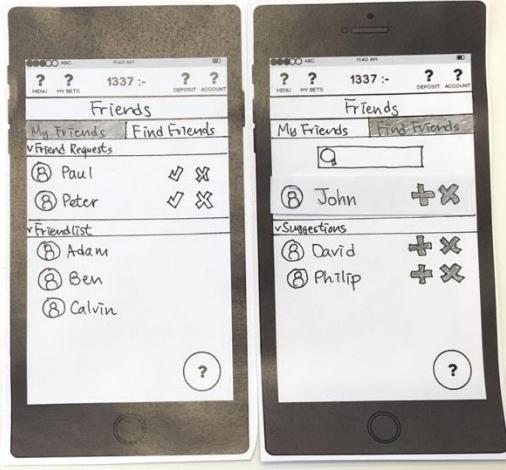
Figure 19 Friends section.

To achieve good consistency, the league section is also divided into two different tabs: *My Leagues* and *Find Leagues*, see Figure 20. On top of my leagues tab there is an option to create a new league, marked as 1. If the create league button is clicked the user will be directed to the create league page where he can enter information, marked as 2, needed to create a league.

Firstly, each league needs a unique name in order for other users to find it. Secondly, the league needs to be based on a competition and a set number of rounds, e.g. Premier League 5 rounds, starting with the next upcoming round. Thirdly, the creator of a league can set the league to be either private or public. If it is public anyone is able to join before the maximal amount of players is reached. On the other hand, if it is set to private, the owner has to invite all participants. Finally, each league has a set amount of money that each user has to pay in order to join. Once the league is finished the winner will receive the total amount of money that all participants have invested into the league.

Moreover, my leagues list the user's league invites and the leagues that the user is currently participating in, marked as 3. To play a round of the league the user needs to press the league title. This will direct the user to the *Bets* tab, which displays all matches available for the current round. On this tab the user can make his selection by pressing one odds per game, marked as 4. Once odds for all matches have been selected, the selections will be saved and the text "Submitted" will appear in the bottom of the screen. In addition, the betslip, marked as 5, will be populated with the same selections to simplify and encourage the placement of an accumulator bet.

Furthermore, the standings of the league are based on how many correct answers each participant has obtained in total and the current standing can be found on the *Standings* tab.

Figure 20 League section.

The challenge feature can be accessed by firstly selecting any odds for any football event. Once the odds are selected, the betslip will be populated and the user can then press the betslip icon as usual. However, now the betslip icon will split into two different options, challenge and betslip, see Figure 21, marked as 1. After pressing the challenge icon, the user will be directed to the challenge page. Here, the user can choose the opponent from his current friend list by entering a name in the text box, marked as 2. To complete the challenge, the user must enter the stake and then press the challenge button.
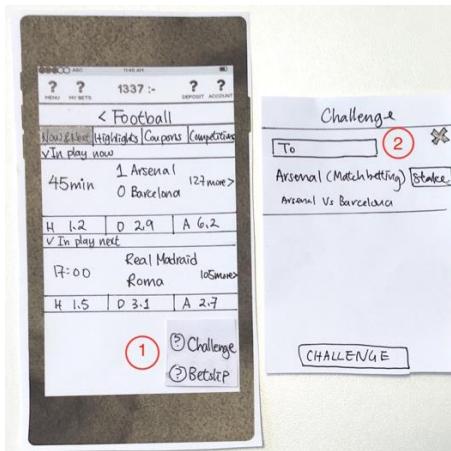
Figure 21. Send challenge.

When the opponent receives a challenge request, a notification shows up on the toolbar over the account icon, see Figure 22. By pressing the notification message

which is marked as 1, the opponent will be directed to the challenge page. The odds that has been chosen by the challenger is marked as unavailable and the remaining odds are available for the opponent to choose among. In order to make the challenge as fair as possible, the system automatically calculates which stake, marked as 2, that needs to be paid for the different selection. For instance, the challenger selected an option with odds 2.00 and set the stake to 100 SEK. Upon receiving the challenge, the opponent then selected an option with odds 4.00, his stake was then calculated to 50 SEK in order to accept the challenge. If the opponent does not wish to accept the challenge, he can of course choose to decline it.
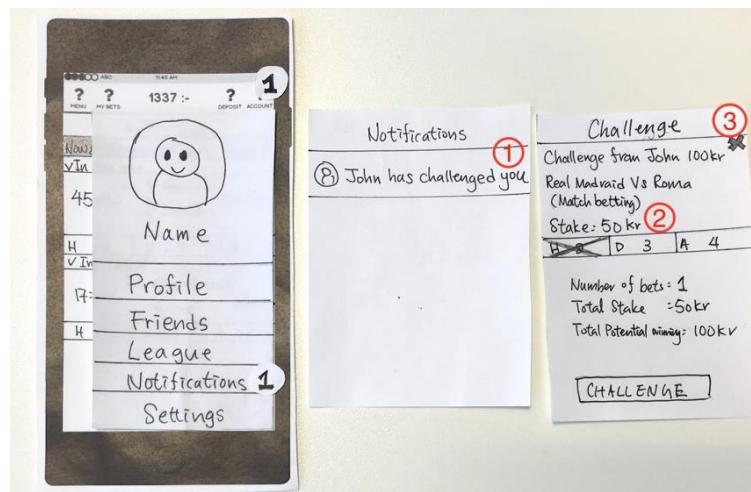
Figure 22 Accept challenge.

The poll feature is intended to work as half-time entertainment on the event detail page for an in-play football event, see Figure 23. Hence, the poll question will always be relevant to a specific match. The user will always be able to easily answer the poll by either pressing yes or no, marked as 1. After selecting an option, a diagram representing the poll's result, marked as 2, will replace the question. The user will have the possibility to skip the question by swiping left, marked as 3, and instead view other information related to the event, e.g. match statistics or match visualization.
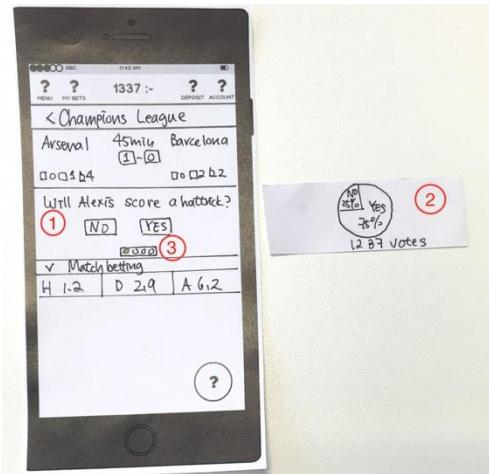
Figure 23. The Poll.

The quiz feature is similar to the poll and is also located on the detail page of in-play events, see Figure 24. The user has the possibility to start or cancel a quiz either by pressing start or cancel, marked as 1. Once the start button is pressed, the quiz questions will appear one by one, marked as 2. When the quiz is completed the results will be displayed, marked as 3.
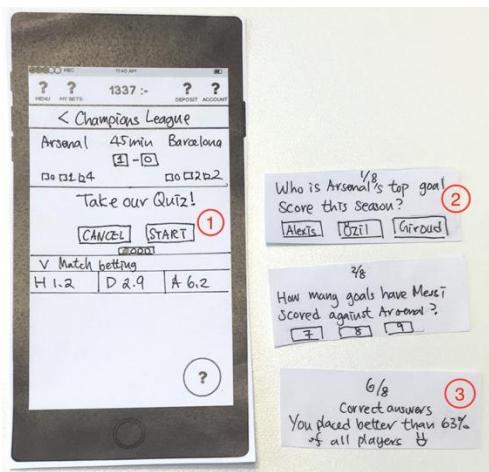
Figure 24 The quiz.

7.2 Formative Test

7.2.1 Method

The formative usability test was conducted individually with three employees from Mobenga, all of them are experts in both UX-design and the sports betting domain.

Firstly, the participants got an introduction to the features that were supported by the lo-fi prototype. Secondly, they were asked to complete seven tasks while thinking aloud. The tasks are listed below:

1. Add John as new friend
2. Create a league named "Test-League" and invite John to participate:
3. Enter Bets for the first round of "Test-League":
4. Create a challenge for an in-play football match
5. Accept a Challenge
6. Vote a poll during an in-play match
7. Answer quiz during an in-play match

The correct action sequences of each task can be found in Appendix D. Moreover, the tests were carried out in an informal way, including discussions between the test moderator and participant. To document the test results, notes were taken throughout the test sessions.

7.2.2 Results

Add a new friend

All participants got confused regarding the icons displayed in the toolbar. Instead of pressing account, they started out by pressing the menu icon. The reason for the confusion was that the participants associated the account option with bank information and passwords rather than more personal options, like friends. In order to correct the erroneous association, the participants suggested other titles that might be more suitable, e.g. *Profile* or *Me*. Once the participants found the account menu, the friends feature was very straightforward and all participants could solve the task without any issues.

Create a new league

The participants were positive about the league feature since it was able to enhance the user's motivation and encourage the user to place accumulator bets. However, during the test a number of potential improvements were mentioned by the participants.

According to the first participant, the process of creating a league could be simplified. To address this, the participant recommended that the number of input fields should be kept to an absolute minimum and that e.g. maximum players could be removed. In addition, the participant mentioned that the amount-to-join input field would be easier to use if it only was possible to enter stake via a textbox instead of having buttons.

Furthermore, the second participant stated that the information on the create league tab could be categorized in a better way to provide a better separation between different input fields. The participant also mentioned that the invite friends option could be redesigned to save space. Instead of entering each username manually on the create league tab, the option could direct the user to a new screen where it could be possible to invite multiple friends at once. In addition, some of the input fields would be easier to understand if they offered explanations.

Furthermore, the final participant pointed out that better feedback is needed once a league is created, the user could for example be directed to the league detail page.

Enter bets for the first round of a league

The first participant thought that the selections for the betting league should not be added automatically to the betslip. Instead the person suggested that an *add selections to betslip* button could be placed on the bottom of the league detail page. Another suggestion that was discussed, was to lock the betslip until the user had finished his selections.

Moreover, the next participant stated that it would be good to add a description that explains what the user needs to accomplish in order to complete each round. In addition, to help the user with fulfilling the task, a progress bar which indicates that e.g. 3/10 matches have been selected could be added.

Furthermore, the last participant thought that it might be better to only display standings on my leagues tab, by doing so the tab-within-a-tab navigation would be removed for bets and standings.

Create a challenge for an in-play football match

Two participants found it difficult to start a challenge since they associated the challenge concept with a person instead of an event. This resulted in them first navigating to a friend instead of first selecting the event that the challenge should be placed upon.

Moreover, all participants stated that the design of challenge feature affected the betslip feature in a negative way, since it added one more step (click) to place a normal bet. This could be very annoying for the users who are not interested in the challenge feature.

Instead of splitting the betslip button, one participant mentioned that the challenge could be placed from either the bet receipt or within the betslip. Additionally,

another participant was curious to see what the challenge looks like, from the recipient's point of view, before submitting it and also would be good to have the possibility to make the challenge more personal.

Accept a challenge

All participants finished the task without encountering any issues.

Vote in a poll during an in-play match

All participants finished the task without encountering any problems. However, all participants mentioned that the design had room for improvements.

The first participant mentioned that the placement of the poll could be separated from the in-play statistics section and instead located below, but still above the betting markets.

Moreover, the second participant stated that the poll question needs a description that clarifies if any bets are involved or not.

Lastly, the final participant mentioned that the *yes* and *no* buttons ought to change placement and that the result of the poll would be better presented with a bar chart instead of a pie chart.

Answer a quiz during half-time, in an in-play match

Same as for the poll, all participants finished the task without encountering any problems. Nonetheless, all participants stated that it was very important to more clearly indicate that the match was in half time break, if the quiz was to replace the match statistics section.

In addition, one participant mentioned that to provide the user with more positive feedback, a possibility would be to display quiz statistics on the user's profile page.

Moreover, from a business point of view, another participant stated that it would be good to integrate some kind of bet functionality with the quiz.

7.3 Conclusion of the Lo-Fi Design

Based on the results of the formative usability testing, Mobenga's preferences and the objectives of the project, the decision to further develop the league and the quiz into a hi-fi prototype was made.

Firstly, the formative test indicated that the lo-fi design of the league is quite good and without any major navigational issues that needs to be fixed. Secondly, Mobenga really appreciated the fact that the design of betting rounds could encourage users to place additional accumulator bets. Thirdly, the league is a type

of social gaming and fulfills many aspects of user engagement, in particular aspects like investment and social rewards.

Furthermore, the participants of the formative user test had no issues while testing the quiz. In addition, they did not encounter any issues while testing the poll either. The reason for selecting the quiz over the poll was that the quiz offers more possibilities in terms of user engagement and as a consequence suits better for this specific project.

Moreover, the challenge created the most number of issues during the formative test and was therefore discarded from further development. In addition, the limited resources of the project did not leave enough time to develop all four concepts any further.

8 Phase 5 - Hi-Fi Design

The purpose of this phase was to further develop the lo-fi prototype into a hi-fi prototype. The phase consists of the design process and summative user testing. At the end of the chapter, conclusions drawn from the results can be found.

8.1 Design

Based on the conclusions drawn in phase 4, the design of the hi-fi prototype focused on the league and the quiz features. A large number of improvements were made and more details were added in order to fully represent the selected features. The hi-fi design was also necessary in order to see how these features could be integrated in a sportsbook solution and how they could affect user engagement.

8.1.1   Method

The hi-fi design process was divided into three iterations. At the end of each iteration a review meeting with Mobenga took place. After each review meeting, the obtained feedback was taken into account and improvements implemented.

The hi-fi prototype was developed with the design tool Sketch, version 3.7.1 (Sketch, 2016), and the prototype tool Pixate, version 2.0.1 (Pixate, 2016). Sketch is a vector-based tool which is used to create user interface designs and Pixate is a tool that creates interactive prototypes for mobile applications by connecting static images with animations and conditions.

All interface designs were created with Sketch. Once the designs were completed, they were exported in the format Portable Network Graphics (PNG). Thereafter, the images were imported to Pixate and connected to a complete prototype. Pixate also provided animations and transitions between different screens and pages.

8.1.2 Results

The main navigation of the hi-fi prototype was based on the lo-fi prototype but with some minor adjustments, see Figure 25. To clarify the functionalities hidden in the side-menus, icons were added and the texts were changed to A-Z for the left toolbar icon, marked as 1, and to ME for the right toolbar icon, marked as 2. The now & next page is still the starting page for each sport and by clicking an event, marked as 3, the user will be navigated to the event detail page.
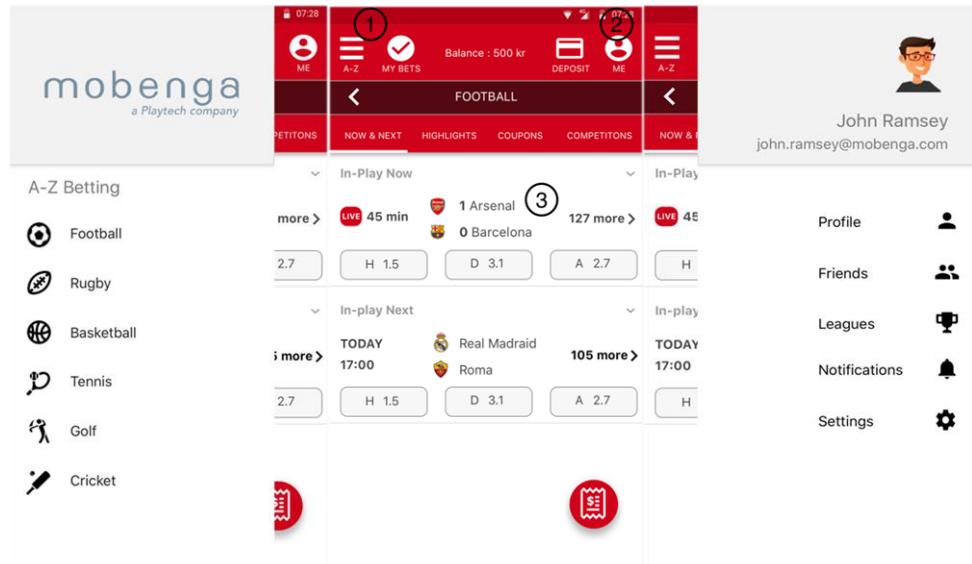
Figure 25 A-Z side-menu to the left, Now & Next page in the middle, ME side-menu to the right

Moreover, the betslip placement is kept the same as in lo-fi prototype and works as a floating action button. This means that the user can access the betslip from any menu within the application. The betslip itself is divided into two tabs, Singles and Multiples, see Figure 26. The user can enter a bet by entering stake for the desired selection and then press the *Accept & Place Bet* button.
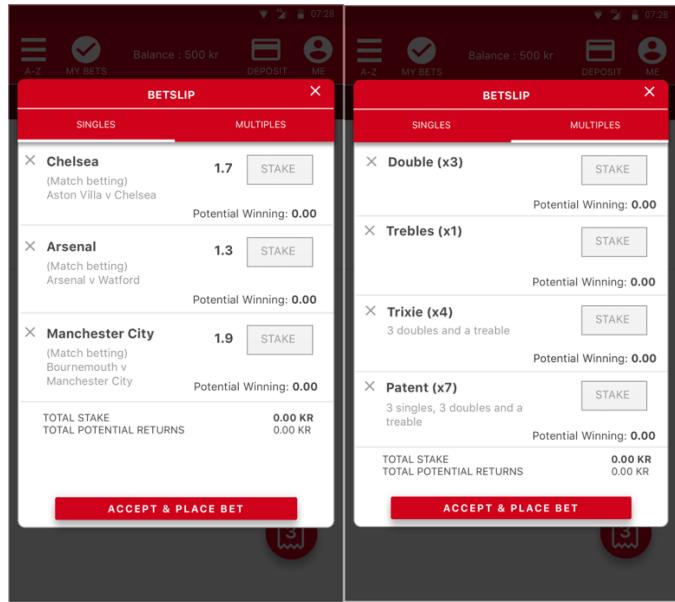
Figure 26 Betslip.

Furthermore, the user's Profile, that can be found under the me icon, displays a custom profile picture, a name, an email address and a home country, see Figure 27. In addition, average results from the quiz and league trophies are displayed.

Figure 27 Profile.

The Friends feature was designed with the same structure as the lo-fi prototype. It is divided into two tabs: *My Friends* and *Find Friends*, see Figure 28. The user's friend list is displayed on the my friends tab and the number of friends is displayed next to the title, marked as 1. On the find friends tab, the user can add new friends, marked as 2. This can be done either by searching for users, accepting requests or adding by suggestion. Once a friend has been added, the feedback text "added" will be displayed, marked as 3, and the new friend will be found under my friends.
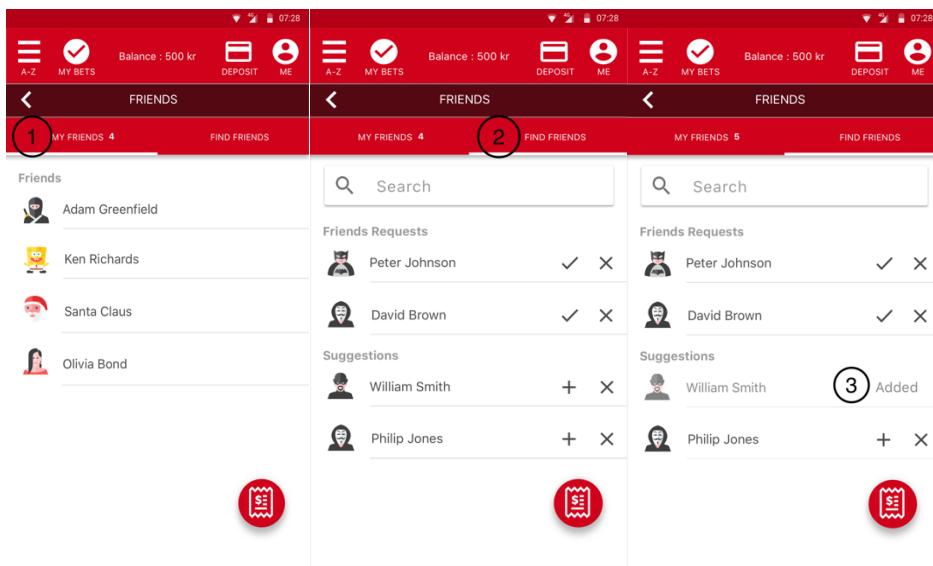
Figure 28 Friends.

Furthermore, the quiz feature is also structured in the same way as the lo-fi prototype, which means that it is connected to an in-play event. The quiz is only presented if the event is at half time break and then replaces the in-play statistics, it can however easily be cancelled by pressing the "x" in the top right corner, see Figure 29. To start the quiz, the start button should be pressed.

Figure 29 Start quiz to the left. After the quiz has been cancelled to the right.

Once the quiz is started, the first question is displayed, see Figure 30. In addition, a countdown bar is displayed indicating the time remaining to answer the question, marked as 1. A correct answer will display a green color, and in contrast, it will display a red color if the answer is incorrect. To provide good feedback, the correct answer will always be indicated even if the user's answer was incorrect. The next question of the quiz will be presented either if the time runs out or after the user has answered the question.

After all questions have been answered, the result of the quiz will be presented. The result page also indicates how the user have performed in comparison to other players.
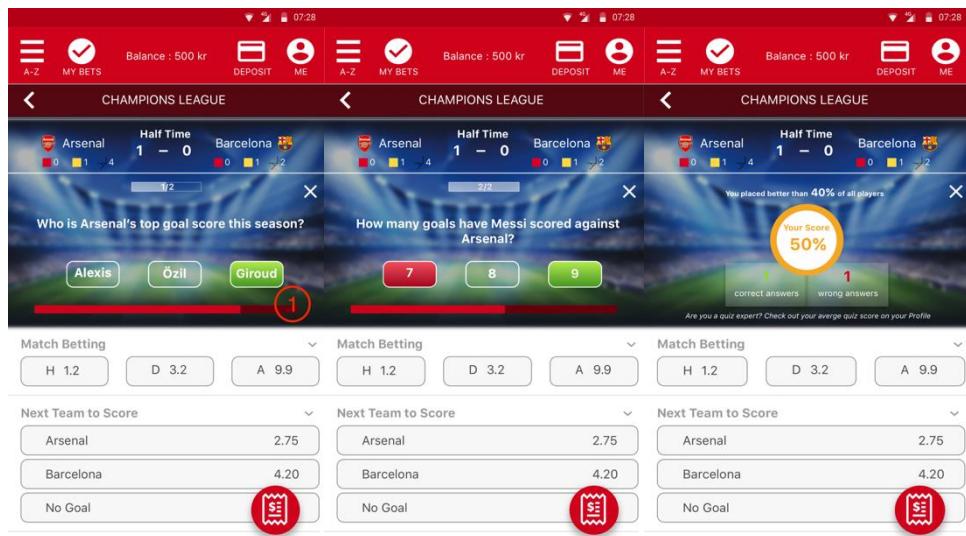
Figure 30 Quiz question 1 to the left. Quiz question 2 to the middle. Quiz result to the right.

Moreover, the main structure of the league feature is based upon the lo-fi prototype, meaning that it was divided into two tabs, *My Leagues* and *Find Leagues,* see Figure 31. My leagues displays all leagues that the user is currently participating in and offers an option to create new leagues.

On the find leagues tab the user can join new leagues by either searching, accepting invitations or joining by suggestion. By pressing the arrow, marked as 1, more information about the league will be displayed to help the user decide to either join or dismiss the league. This information contains the league host, the league competition, number of rounds and stake.
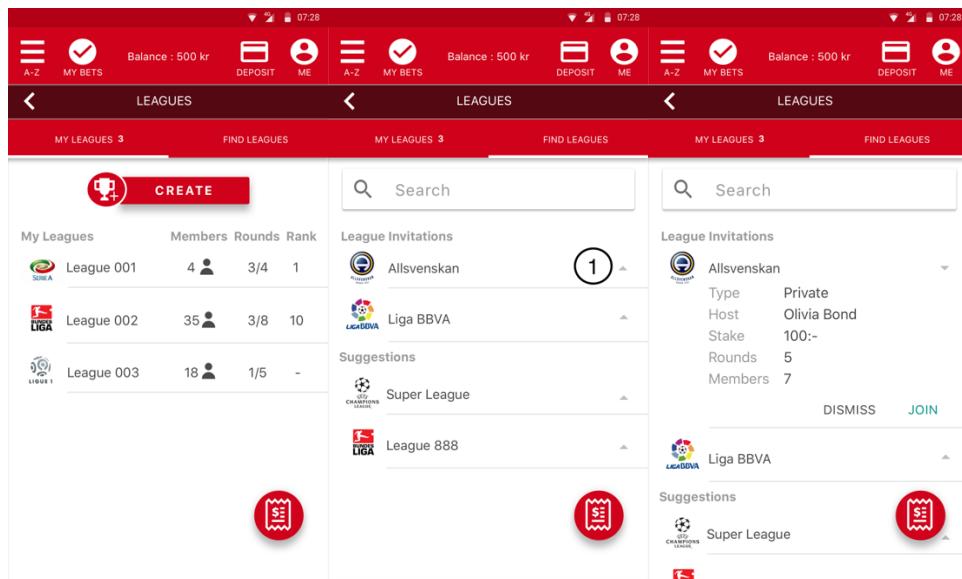
Figure 31 My Leagues to the left. Find Leagues in the middle. Invitation details to the right.

In order to create a league, the user should press Create League on top of the My Leagues tab. Once the button is pressed, the create league page will be presented, see Figure 32. Here the user will be prompted to enter the information that is needed to create the league.
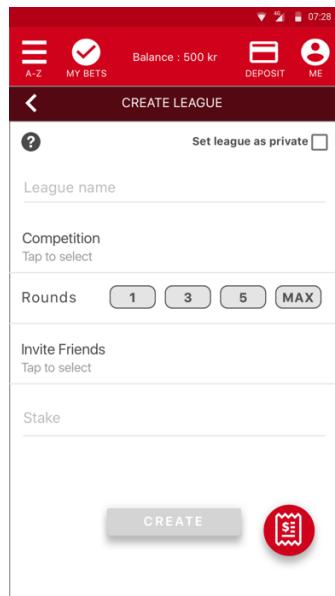
Figure 32 Create League.

To help the user with creating a league, a tutorial is presented for new users, see Figure 33. The tutorial helps the user by explaining all the steps required to create a league. Firstly, it displays the customization options, secondly it displays the league formats, thirdly it displays how to invite friends and finally how to set the stake.
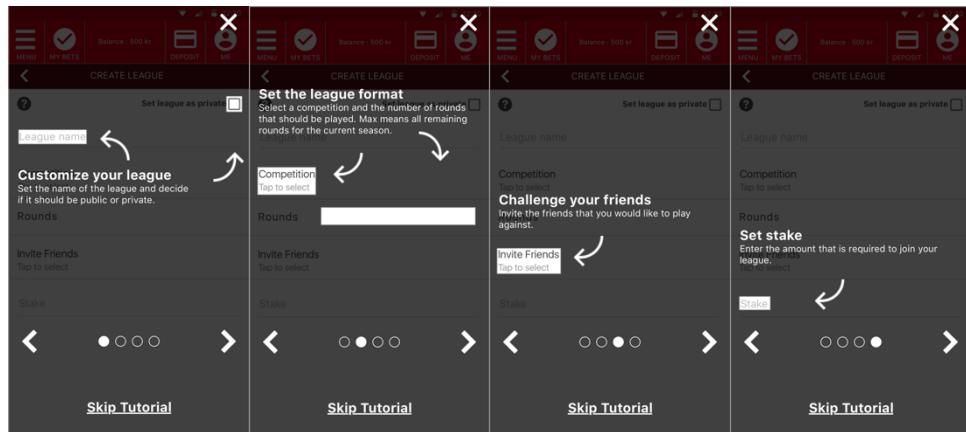
Figure 33 Create League tutorial.

Once the tutorial is completed (or cancelled) the user can enter the required information and create the league, see Figure 34.
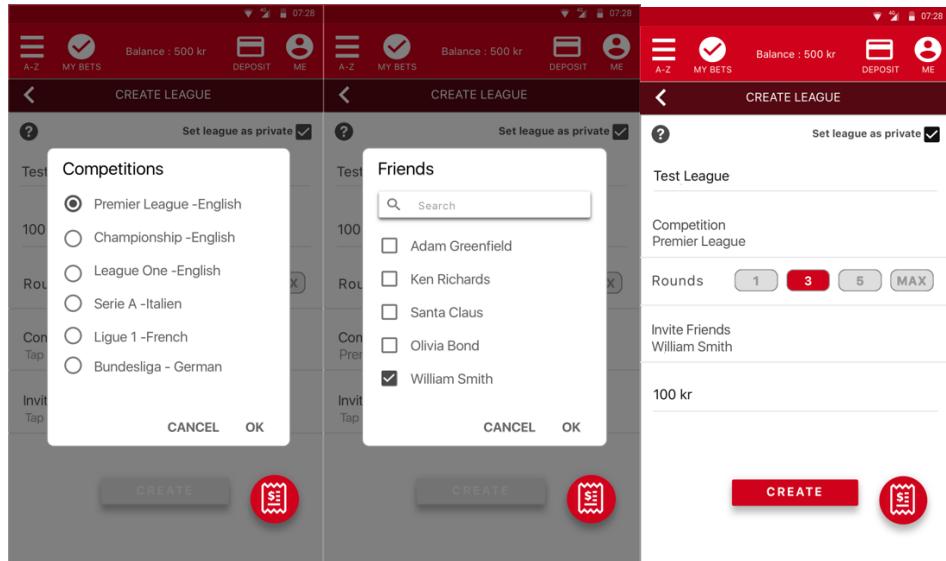
Figure 34 The select competitions menu to the left, the select friends menu in the middle, the finished output to the right.

Furthermore, when the new league is created, it is displayed on the my leagues tab. By pressing a league name the user will be directed to the league detail page where the stake, potential winning and current standings can be found, see Figure 35. By clicking on one of the players, marked as 1, details regarding his previous selections will be displayed. More information regarding each match can also be found by clicking one of the matches, marked as 2, in the list.
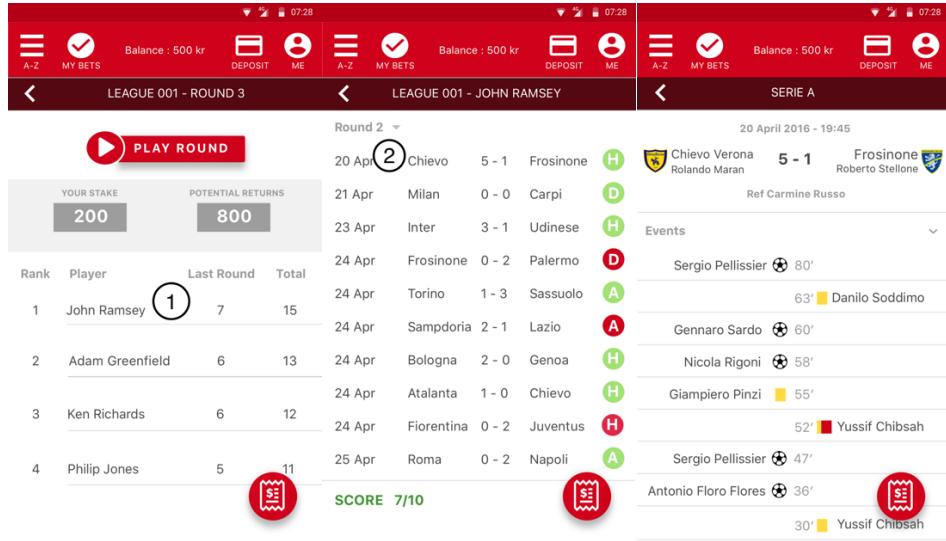
Figure 35 League detail page to the left, player result page in the middle, match result page to the right.

Moreover, it is also possible to play rounds from the league detail page. This is achieved by pressing the button *Play Round* on top of the league detail page and to help the user with making his selections a tutorial is offered, see Figure 36. Firstly, the tutorial displays how to select the round, secondly it explains the add to betslip feature, thirdly it shows how to make selections and finally, how to confirm the selections.
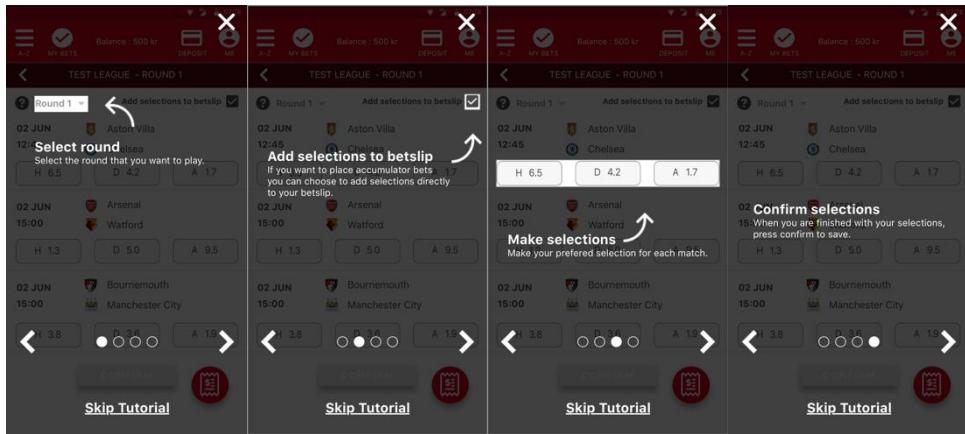
Figure 36 Play round tutorial.

Furthermore, after the tutorial is either completed (or cancelled) the user is asked to select round and place his selections, see Figure 37.
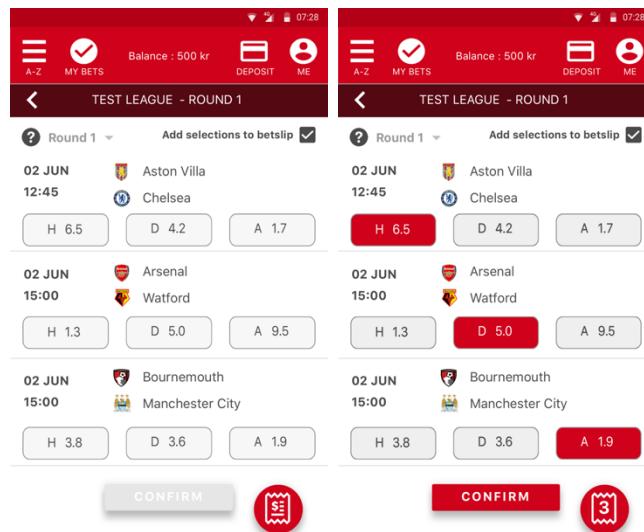
Figure 37 Play round, before to the left and after to the right.

Once the selections have been confirmed, they are displayed for review, see Figure 38. The *H* icon represents home win, the *D* icon represents draw and the *A* represents

away win. From this menu the user can either go back to my leagues or press the betslip to place bets for the saved selections.
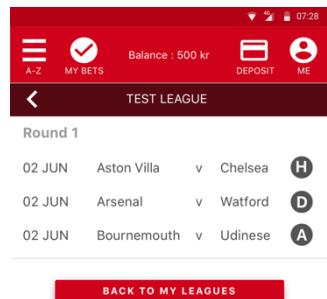
Figure 38 Review of league selections.

8.2 Summative Test

The purpose of performing the summative test was to validate the prototype's usability and measure how it was perceived by users representing the target group.

8.2.1 Method

The summative test was conducted individually with five persons, matching the Ladbrokes Life target group, see chapter 1.4.1. Three of the participants also participated in the Field Study, see chapter 2.6. Furthermore, all participants were students at Lund University. Four of them were either classmates or friends and the last participant was unfamiliar. All participants were between the ages 20-30 and were interested in football but had different degree of previous betting experience.

Firstly, each test session began with a briefing that introduced the new features and the parts that was included in the test. The briefing followed the orientation script that can be found in appendix E.1.

Secondly, the participant was asked to complete the following six tasks:

1. Answer a quiz during the game between Arsenal and Barcelona.

2. Find your average quiz score.
3. Add William Smith as new friend.
4. Create a private league named "Test-League", choose Premier League and invite William Smith to participate.
5. Play the first round of "Test-League".
6. Check your results from round 2 in League 001.

Thirdly, once the tasks were completed, the participant was asked to fill out the AttrakDiff questionnaire. This questionnaire is the same as the one used in the field study, see chapter 2.7.

Finally, a debriefing was conducted. The debriefing consisted of the following questions:

1. What are your overall thoughts on using the prototype?
2. Which of the features did you like the most? Why?
3. Do you think that these type of features are suitable for a sports betting application? Why?
4. Do you think the features improves or worsens the application? Why?
5. Would these features make you reuse the application? Why?

In order to collect relevant data, the summative test was performed in a usability lab, using the same setup for all participants, in order to make the performance data comparable. A screen recorder was used to record the user's clicks and actions and all audio was recorded with a microphone.

8.2.2 Results

The results of summative test were divided into three categories: performance data, questionnaire data and interview data. The raw data can be found in Appendix E.2.

Performance data

Figure 39 presents the time for completing each task, and each participant is represented by a unique color. Participants 1-3 were classified as expert user, participant 4 as intermediate and participant 5 as novice.
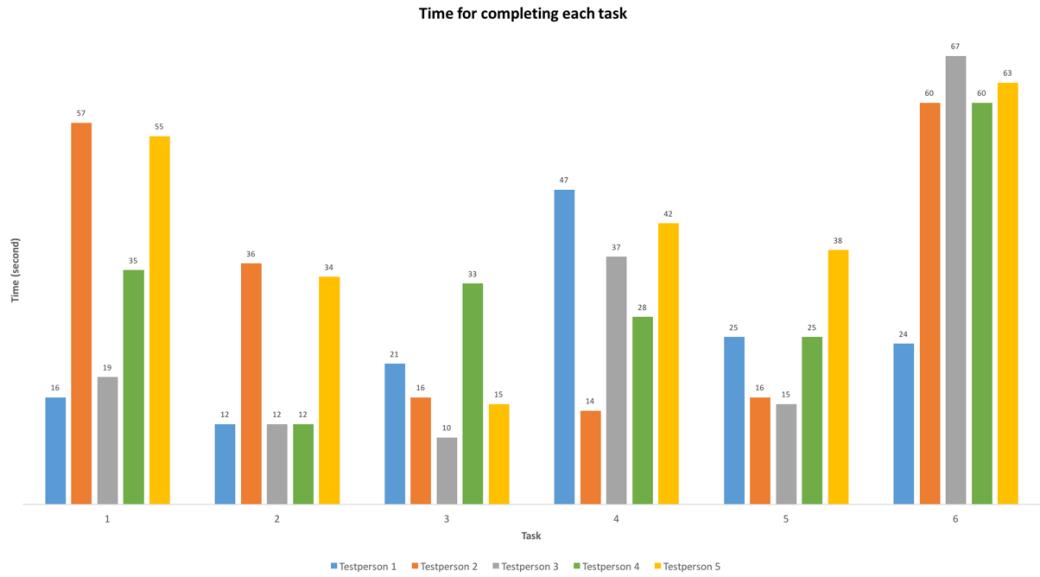
Figure 39 Time for completing each task.

The average time and standard deviation for each task are summarized in Table 8. The standard deviation indicates the variance of the completion time, and the greater the standard deviation the greater the variance.

Table 8 Average time and standard deviation for each task.

	Average time(second)	*Standard deviation*
Task 1	36s	17
Task 2	21s	11
Task 3	19s	7.8
Task 4	34s	12
Task 5	24s	8.3
Task 6	55s	16

Table 9 presents the average number of errors and the standard deviation per task for all participants. An error was defined as an incorrect action, e.g. pressing the betslip button instead of the play round button.

Table 9 Average number of errors and standard deviation for each task.

	Average number of errors	Standard deviation
Task 1	1	0.89
Task 2	1.4	1.4
Task 3	0.6	0.8
Task 4	0.4	0.8
Task 5	0	0
Task 6	2.4	2.3

Table 10 presents the average number of hints and the standard deviation per task for all participants. The hints were given in order to help the user complete the task if the correct action could not be found. The hints were provided for one participant on task 2 and for four participants on task 6.

Table 10 Average number of hints and standard deviation for each task.

	Average number of hints	Standard deviation
Task 1	0	0
Task 2	0.2	0.4
Task 3	0	0
Task 4	0	0
Task 5	0	0
Task 6	1.2	0.75

Questionnaire

The results of the questionnaire are divided into four dimension: Pragmatic quality (PQ), Hedonic Quality - Identity (HQ-I), Hedonic Quality - Stimulation (HQ-S) and Attractive (ATT). Figure 40 displays the average value of each dimension.

Diagram of average values
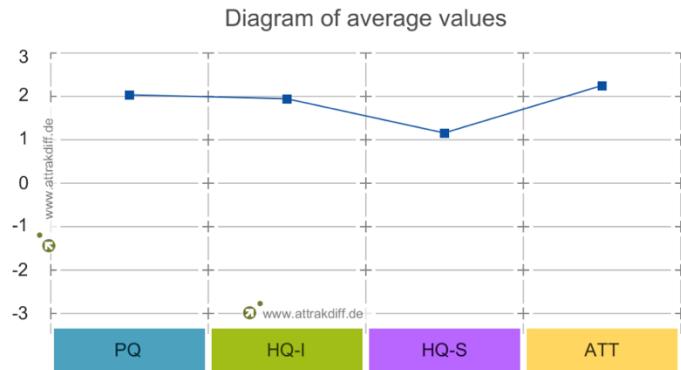
Figure 40 The average value of the AttrakDiff dimensions.

Figure 41 displays the hedonic quality on the vertical axis and the pragmatic quality on the horizontal axis. In regards to the values of the two dimensions, the system has been classified in a so called "character-region". The dark blue, smaller, rectangle indicates the medium value and the light blue, bigger, rectangle displays the confidence area. The prototype has been classified in the character-region *desired*.
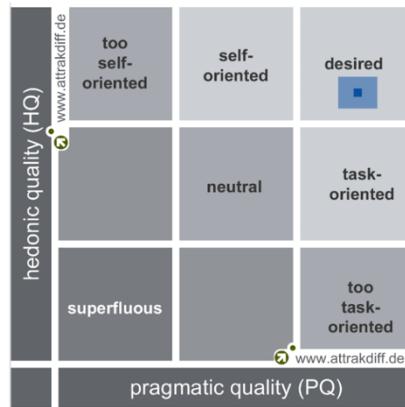
Figure 41 Hedonic and Pragmatic quality matrix.

Figure 42 displays the average value of each individual word-pair. The extreme values are of most interest since they indicate which characteristics that cause a particular risk or benefit.

69
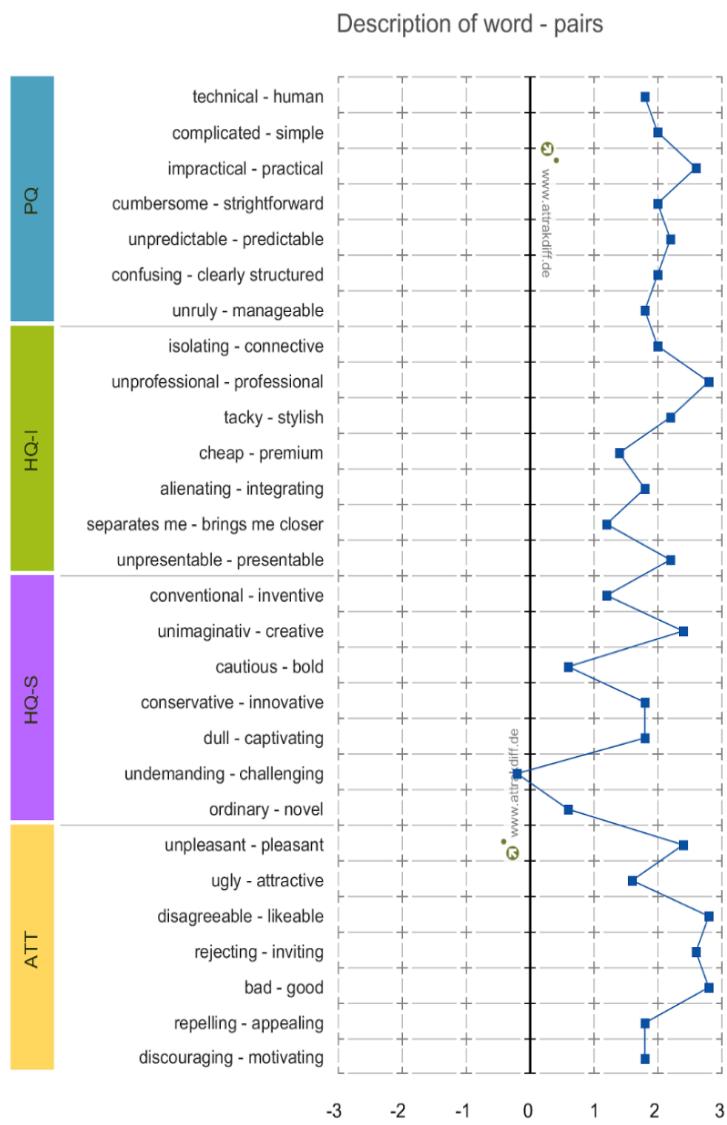
Figure 42 Average value of the AttrakDiff word-pairs.

Interview data

Question 1: "What are your overall thoughts on using the prototype?"

All five participants gave positive feedback regarding their experiences on using the prototype. From the answers the following keywords were identified:

- Responsive and easy to use.
- The interface is pleasant and simple.

70

- The functionalities, icons and buttons are easy to understand and logical.
- It differs from other sportsbooks and it is positive to see some new features.

Question 2: "Which of the features did you like the most? Why?"

The participants' answers are presented in Figure 43. Three participants preferred the quiz and two participants preferred the league. The motivation behind their answers are listed in Table 11.
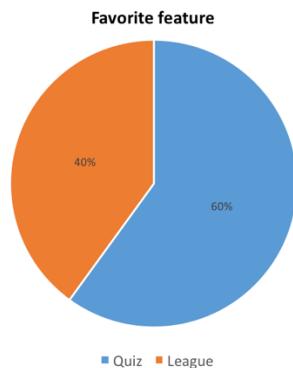
Figure 43 The distribution of the participants' favorite feature.

Table 11 Motivation for choosing the favorite feature.

Quiz	*League*
It is more intuitive and the interface is more colorful.	It is a lot of fun to play against friends and perhaps win their money.
The halftime break is usually quite boring; it is fun to have some entertainment to pass the time. It is also good that the quiz questions are affiliated to a specific match.	The league feature does not exist in other sportsbook application. The quiz feature already exists in other livescore applications such as Forza.
It is easy to play and does not require as much time and thoughts as the league.	

Question 3: "Do you think these types of features are suitable for a sports betting application?"

All participants thought both the quiz and the league features were suitable for a sports betting application. One participant mentioned the features can reduce the feeling of that "*it is just all about the money*" which makes the application more attractive and relaxed to use.

Furthermore, another participant stated that he knows many friends who enjoy betting together and that a league would be perfect concept for them.

71

Question 4: "Do you think the features improve or worsen the application? Why?"

No participant mentioned any negative impact of the features. On the contrary, all participants stated that the features would improve the betting experience since it would make the experience more sociable and fun. Moreover, the features are optional and one participant stated that he did not need to use the features if he did not want to and hence, the overall experience would not be impaired.

Question 5: "Would these features make you reuse the application? Why?"

All participants stated that these features would make them reuse the application. Firstly, because both features gave an interesting and fun experience. Secondly, since the addition of social aspects and entertaining features makes it more likely to use one sportsbook instead of multiple ones. Lastly, two participants stated that it would be too time consuming to create their own leagues but it would be very fun to be challenged and join leagues created by friends.

8.3 Conclusion of the Hi-Fi Design

The summative test provided a lot of important feedback. Firstly, the participants completed all tasks and only required help from the test leader on task 2 and task 6. The amount of errors was also low for all tasks, especially for the one that related to the creation and playing of a league. Secondly, the prototype scored high on all dimensions of the AttrakDiff questionnaire. This means that the prototype offers good usability, stimulation, is easy to identify with and gives an attractive impression. Thirdly, according to the test participants, both the quiz and the league would integrate well with current betting solution. Fourth, both features would improve the application but the opinions were divided on which feature that was the most enjoyable. This could also be seen as positive since both features attract different kind of user personalities. Finally, and most positive, all participants stated that the introduction of these features would make them reuse the application.

However, the prototype also had some aspects that could be improved. Firstly, some users had some difficulties completing task 1. This could be a result of bad affordance from the now & next page which did not offer any information about available quizzes. Secondly, the participants did not understand the direct connection between quiz results and the profile page. This connection should be clarified by increasing the visibility of the text on Figure 30. Thirdly, all users missed both the create league and play round tutorials. This means that the info icon, see Figure 32, should be more visible or that the tutorial should be automatically started for all new users. The good performance results of task 3 and 4 did however indicate that the tutorials might not be needed at all. Finally, task 6 caused the most problems for the participants and no one completed it without any errors or hints.

The reason for this was that the league detail page offers bad affordance and that the navigation header, which indicates current round, confuses the users, see Figure 35.

9 Discussion

This chapter presents a discussion regarding the results and process of this master thesis. What could be improved, are there any ethical implications and what future work could be done?

9.1 Investigation

Since the objective of this thesis was divided into two major parts, one evaluation part and one design part, the work process had to be tailor-made for this thesis. We found that in order to properly evaluate the product we first had to obtain great knowledge of the product and domain ourselves. This was a great challenge since there is a lot of details and market specifics to learn. However, after completing phase one everything started to fall into place. In retrospect, this phase together with the literature study was probably the most important ones since they laid the foundation for the entire thesis.

9.2 Evaluation of Ladbrokes

In phase two, when evaluating the current product, the methods cognitive walkthrough and field study were used. During the phase more focus was placed on the field study since it would provide more data in regards to the current user experience and user engagement, see chapter 2.3 and 2.4, and thereby help to fulfill the goals of this thesis. However, this decision resulted in a lacking usability evaluation and the choice of a more extensive method, like a formal usability test would have provided more solid results. In addition, the cognitive walkthrough method is based upon the competence of the evaluators, which means that the results will most likely vary based on the evaluator's competence.

9.3 Design Process

Phase three determined which concepts that should be implemented in order to enhance the sportsbook's user engagement. It is difficult to say which of the user stories that would have the greatest engagement effect, but both gamification and social gaming concepts fulfills many aspects according to both Eyal and O'Brien & Toms, see chapter 2.3.

Moreover, in order to more accurately prioritize the user stories a larger user study could have been conducted to better represent the end users' preferences. Instead, we choose to rely on the experience of Mobenga and our own obtained knowledge from previous phases.

The development of the lo-fi prototype was quite straightforward and the finished prototype fully accomplished its purpose. The greatest challenge was to integrate the new features without interfering with existing functionality, but by keeping the process iterative and using flexible prototype tools, good integrations were achieved. However, the suggested implementation of the challenge was not optimal and even though it was of high priority it had to be discarded. If given more time, the implementation of the challenge would have been improved and all four concepts would have been included in the hi-fi prototype.

Since the development and testing of the lo-fi prototype was extensive, it was easy to start the design of the hi-fi prototype. The results of the hi-fi design phase were validated by a summative test, which pointed to that the introduction of social and gamification features would lead to an engaging prototype. To further validate these results, additional testing on a larger demographic group would have to be performed. Unfortunately, there were no such recourses available for this project.

9.3.1   Selection of design tools

Before the start of development of the hi-fi prototype the preferred design tools had to be selected. Since Mobenga was in the process of migrating to use Sketch (Sketch, 2016) we thought it would be wise to utilize it in this project based on the provided support. When it came to selecting the prototype tool it was a bit more difficult since there were so many options available. Firstly, more established tools like Axure (Axure, 2016) and Invision (Invision, 2016) were investigated but without any great success. Axure seemed to have a steep learning curve and offered a lot of features that was not required for our prototype. Invision also offered features that were of no relevance to our project and had limited possibilities for transitions and animations when moving between different screens. Furthermore, tools with better support for native, like Principle (Principle, 2016) and Pixate (Pixate, 2016) were investigated. Both tools offered the functionality that we required but since Pixate was free and supported both iOS and Android it was selected over Principle.

Looking back at the design process, better integration between Sketch and Pixate would have been more convenient. As of now, all assets have to replaced manually for every minor adjustment which is very time consuming. This could be a reason for perhaps selecting Principle when developing similar prototypes in the future.

9.3.2 Selection of test participants

Since the thesis' target group matches the age and profile of many university students it was not difficult to find test participants for both the field study and the summative test which has been of great advantage to the end results. One could argue that the formative test also should have been conducted with real end users, but this was given lower priority than the field study and summative test due to the thesis' time constraints. It was also a great benefit to be able to utilize the competence at Mobenga, both in regards of domain knowledge and UX design.

9.4 Measurement of User Engagement

One of the biggest challenges for this master thesis was to find sufficient ways to measure user engagement. Due to the lack of user data provided by Mobenga and also the limited time frame of the thesis, web analytics measurements had to be excluded. In addition, physiological measures were not a reasonable possibility since the lack of experience and resources.

Therefore, all measures of user engagement and user experience are self-reported by users participating in different tests. In order to get more accurate results, a combination of measures should be used, e.g. web analytics over a longer period of time and physiological measures during interaction.

9.5 Ethical Considerations

For most people sports betting is something fun that helps with adding extra excitement to sporting events or a chance to win some money based on either a hunch, a pure guess or statistics. Unfortunately, this is not the case for everyone. In 2014, 2,2% of Sweden's population was classified as gambling addicts and around 14% of them were in such deep trouble that they were in need of treatment (Forseberg, et al., 2010). In addition, sports betting and particular online betting is the services that currently are growing the most in terms of revenue (Lotteri Inspektionen, 2015).

With this background, there are some ethical considerations that needs to be taken into account when looking back at this master thesis. The suggested enhancements of the user engagement could potentially increase the time users interact with a gambling application and according to the theory presented in chapter 2.4, the users are then more likely to actually place more bets.

In conclusion, the enhancement of user engagement positively benefits the platform developers, the gaming operators and end-users without gambling issues. However, they could negatively affect addictive users to spend even more time with the application and perhaps even make other users start gambling too much. It is therefore very important that especially gaming operators take responsibility for their services and provides help for users with gambling issues.

9.6 Future Work

In order to enhance the user engagement of Mobenga's sportsbook there is some work left to complete. Firstly, the remaining improvements discovered during the summative testing of the hi-fi prototype need to be resolved. Secondly, the profile page could be further developed and the effect of the different awards and how they relate to user engagement could be investigated in more detail. Thirdly, the quiz needs to be connected to a content management system (CMS) to make the customers able to publish new questions in regard to specific events. Finally, the new features would need to be integrated and released in Mobenga's current sportsbook solution.

Once released, it would be very interesting to measure the changes of the user engagement, with a combination of self-reported and web analytic measures, before and after the release in order to see long-term effects.

10 Conclusion

The aim of this chapter is to answer the research questions based on the theories and results presented previously.

10.1 What are the current usability limitations of in-play football betting while using Ladbrokes' sportsbook?

The results from phase two indicated that Ladbrokes' usability was good. However a few usability issues that limited the usage of the product were identified. Firstly, based on the characteristic ease of learning and error tolerance (Quesenbery, 2010), the entire eventbox should be made clickable. In addition, the visibility and meaning of the add-to-slip button could be clarified in order to improve the ease of learning. Moreover, the coupon page could provide better feedback to help the user recover from errors, for instance by blocking the possibility to choose two odds from same market or notifying the user that the current selection is not available for accumulator bets.

Secondly, the high amount of leagues and competitions which were displayed on the competition page made it difficult for the user to locate a specific match. The same issue was encountered on the event detail page, but for markets instead of match, where a wide array of markets is available for selection. To solve this issue, options included in the same categories should be grouped together and have a clear separation from other categories. This would improve the application's efficiency (Nielsen, 1993).

Lastly, the three different ways to place a bets confused some of the users. To achieve better consistency and decrease the risk of confusing the user, it would be better to only provide one way of placing a bet. Moreover, novice users encountered problems when they were using the betslip to place accumulator bets. This indicates that learnability (Nielsen,1993) of the betslip could be improved.

10.2 How are the users perceiving Ladbrokes' current in-play football betting experience?

Firstly, the observations from the field study, pointed to that the overall navigation of the application could be improved. The current navigation made it cumbersome for the several test participants to find both specific matches and markets. This indicated that the navigational improvements should be focused on the event detail page and the competitions tab. Moreover, some participants were confused about how to place accumulator bets. In this case, more instructions should be provided, particularly for novice users.

Secondly, the results of the AttrakDiff questionnaire classified the application as "task-oriented". In more detail, keywords like simple, practical, straightforward, manageable and clearly structured scored high, while characteristics like novelty, innovative, bold, stylish and connective scored low. This indicates that the users feel that the application was simple to use, but could be improved in the hedonic dimensions.

Thirdly, the results of the interviews were consistent with the results of the questionnaires. Most participants mentioned that the application was very easy to use. One participant even stated that "the application is too easy to use" which can be seen as a very positive comment. Moreover, the application was particularly good for expert users who nearly did not encounter any problems at all. In addition, eight out of ten participants of the field study stated that they would like to explore more parts/features of the application. This indicates that the participants felt that the application was quite interesting. On the other hand, most participant did not mention that they had any favorite feature or any feature that they particularly disliked. This points to the application being quite standard compared to its competitors. In addition, the participants stated that they were missing a few features that would improve the application.

Fourthly, five participants stated that they would like to use the application again. The main reasons for this was the application's simplicity, the large number of markets and the strong Ladbrokes brand. Three participants answered that they might use the application again after comparing odds and promotions with other gaming operators. The two final participants did not want to use Ladbrokes again because they could not see any benefits in regards to its competitors. These results indicated that both odds, promotions and brand image are important aspects of the user experience, this also aligns with theory presented in chapter 2.3.

Finally, the application works very well in its specific context of use. In-play sports betting is of very high pace and requires the user to quickly place bets in connection to situations occurring in the on-going event. The application supports this experience well by offering such good usability.

10.3 How could the user engagement in a sportsbook be enhanced?

This research question covers all aspects of user engagement and has been divided into three sub questions for better overview. The answers to these questions are presented below.

10.3.1 How can user disengagement be prevented during a game or within a short window of time, for example an afternoon?

According to O'Brien & Toms, see chapter 2.4, usability issues, lack of novelty, interruptions and lost interest are the factors that could cause disengagement. From a design point of view, only usability issues and the lack of novelty could be affected and therefore, the thesis has focused on those aspects.

Firstly, the usability of the application needs be good to avoid disengagement. It is therefore very important to keep the good usability level even after implementing enhancements of the user engagement.

Secondly, an application that avoids disengagement need to be innovative and novel. This can be difficult to achieve, but by introducing new interesting features and keeping up to date with modern technologies, it is possible. Moreover, the introduction of such features can also extend the period of engagement.

Thirdly, according to Fogg, the ability, motivation and trigger all needs to be present in order for an action to take place (Fogg, 2009). This means that as long as these factors are present, disengagement will be avoided.

Lastly, to prevent disengagement, the period of engagement need be prolonged. As mentioned in phase three, this could be achieved by introducing features such as social gaming and gamification. According to our results, the users perceived both social gaming and gamification, represented by the league and the quiz, as interesting elements. Another important aspect that impacts the engagement period is the challenge level (O'Brien & Toms, 2008). In our implementation, the quiz achieves this by having a fixed answering time for each question to prevent extensive "googling".

10.3.2 How to make the user reengage the application during a game or within a short window of time?

Short-term reengagement is defined as the likelihood of reusing an application within a short period of time. The factors that contribute to reengagement are positive past user experience, good and useful content, convenience, domain interest and also curiosity of what has happened during the absence (O'Brien & Toms, 2008). Therefore, this thesis focused on these factors with the exception of domain interest, since that factor could not be affected.

The implementation of the quiz feature aimed to enhance the short-term reengagement by providing gamification and interesting entertainment during the halftime break of a football match.

The quiz offers engagement by enabling both internal and external triggers (Eyal, 2014). The internal one is the sense of boredom or restlessness that the half time break introduces. The external trigger is simply the title "Take the quiz during halftime" which invites to action. Furthermore, the results of the summative test indicate that the quiz offers good usability, which in turns makes the feature convenient to use. This was further emphasized by the posttest interviews.

In addition, by offering the users a variable reward for quiz completion, in form of direct feedback and profile statistics, they are more likely to reengage (Eyal, 2014).

10.3.3 How to make the user reengage the application after a certain period, for example the day after or the week after?

The theory behind long-term reengagement is similar to the one of short-term reengagement, but instead focusing on the likelihood of reusing the application after a longer time period. To accomplish this purpose, the league features was implemented.

The league feature is based upon social gaming, which provides users with the possibility to play against each other. Social reasons are one of the points of engagement (O'Brien & Toms, 2008). This also contributes to reengagement and therefore makes the users more likely to return to an application. Furthermore, variable rewards are another way to make the users more likely to return to the application (Eyal, 2014). The league offers both social rewards and rewards of the self. The rewards are represented by trophies on the user's profile page or on the standings page of each league detail page.

Moreover, the value of a product increases with the time and effort that the users invest (Eyal, 2014). The process of adding friends and setting up your own leagues can be seen as an investment of both time and resources and after completing these processes the user will be more likely to return to the application.

81

In addition, the curiosity of what has happened in the user's absence also impacts user reengagement (Eyal, 2014). For instance, the user could be curious of the current league standings or be interested in other users' performance after each round.

The results of AttrakDiff indicates that the user experience of the hi-fi prototype is perceived as "desired". In addition, both the quiz and league are recognized as well integrated and useful features that impacts reengagement in a positive way.

References

Attfield, S., Kazai, G., Piwowarski, B. & Lalmas, M. 2011. *Towards a science of user engagement.* WSDM Workshop on User Modelling for Web Applications.

Axure. 2016. *Diagrams, prototypes, and specs in one.* http://www.axure.com/features (Accessed 2016-05-16)

AZ screen recorder. 19 October 2015. *AZ Screen Recorder Premium v3.0 Apk.* http://indexapk.net/android-apps/az-screen-recorder-premium-apk.html (Accessed 2016-02-19)

Balsamiq. 2016. *Balsamiq Mockups.* https://balsamiq.com (Accessed 2016-03-23)

European Gaming, Betting Association (EGBA). 2013. *Market Reality.* http://www.egba.eu/facts-and-figures/market-reality/ (Accessed 2016-05-30)

Eyal, N. 2014. *Hooked: How to build a habit-forming products.* New York: PenguinGroup.

Fogg, B.J. 2009. *A Behavior Model for Persuasive Design.* Calremont, California, USA.

Forseberg, L., Forseberg, K. & Knifström, E., 2010. *Motiverande samtal vid spelproblem och spelberoende. En praktisk manual.* Statens folkhälsoinstitut, Östersund. https://www.folkhalsomyndigheten.se/pagefiles/12407/motiverande-samtal-vid-spelproblem-en-manual.pdf (Accessed 2016-05-16)

Google. 2016. *Material design.* https://www.google.com/design/spec/material-design/introduction.html# (Accessed 2016-03-23)

Hassenzahl, M. 2007. *The hedonic/pragmatic model of user experience.* Proceedings of COST294-MAUSE Workshop, Lancaster, UK, pages 10-14.

Hassenzahl, M., Burmester, M. & Koller, F. 2003. AttrakDiff: Ein Fragebogen zur Messung wahrgenommener hedonischer und pragmatischer Qualität [A questionnaire for measuring perceived hedonic and pragmatic quality]. In Ziegler J., Szwillus G. (Eds.) *Mensch & Computer 2003. Interaktion in Bewegung*, B.G. Teubner, Stuttgart, pages 87-196.

Hassenzahl, M. & Tractinsky, N. 2006. *User experience - a research agenda.* Behavior and Information Technology, 25:2, pages 91-97.

I Gaming Business. 30 September 2015. *Bet365 profits surpass £400m in fiscal 2015*.
http://www.igamingbusiness.com/news/bet365-profits-surpass-400m-fiscal-2015
(Accessed 2016-02-06)

Invision. 2016. *Design better.Faster.Togther.* https://www.invisionapp.com
(Accessed 2016-05-16)

International Organization for Standardization (ISO). 1998. *ISO 9241-11: Ergonomic
requirements for office work with visual display terminals (VDTs) -- Part 11:
Guidance on usability*. Genève, Switzerland, International Organization for
Standardization.

International Organization for Standardization (ISO). 2009. ISO 9241-210 : *Ergonomics of
human system interaction - Part 210: Human-centered design for interactive
systems* . Genève, Switzerland, International Organization for Standardization.

Karat, J. 1997. *Evolving the scope of user-centered design*. Communications of the ACM.
Vol 40, Issue 7, pages 33-38.

Ladbrokes. 2016. https://sports.ladbrokes.com/en-gb/ (Accessed 2016-05-30)

Ladbrokes Life. 29 October 2014. *This is the Ladbrokes Life*
http://www.ladbrokesplc.com/media/features/2014/this-is-the-ladbrokes-life.aspx
(Accessed 2016-02-17)

Lalmas, M., O'Brien, H. & Yom-Tov, E. 2014. *Measuring User Engagment.* Synthesis
Lectures on Information Concepts, Retrieval, and Services, Vol. 6, No. 4, pages
1-132. Morgan & Claypoo Publishers.

Lotteri Inspektionen. 2015. *Spelmarknadens utveckling I sverige och internationellt*,
http://www.lotteriinspektionen.se/Global/Broschyrer/Spelmarknaden%202015.pd
f (Accessed 2016-05-16)

Magnusson, C., Rassmus-Gröhn. K., Tollmar, K. & Deaner, E. 31August 2009. *User Study
Guidelines*. http://www.english.certec.lth.se/haptics/papers/HaptiMap_d12.pdf
(Accessed 2016-02-05)

Mobenga. 2016. https://www.mobenga.com (Accessed 2016-05-30)

Nielsen, J. 1993. *Usability Engineering*. San Francisco: Morgan Kaufmann.

Norman, D. 2002. *The design of everyday things*. New York : Basic Books.

Norman, D. & Draper, S.W. 1986. *User centered system design.* Hillsdale, New Jersey:
Lawrence Erlbaum Associates, publishers.

Norman, D. & Nielsen, J. 2016. *The Definition of User Experienc*e. Nielsen Norman
Group. http://www.nngroup.com/about/userexperience.html (Accessed 2016-02-
09)

O'Brien, H. & Toms, E. 2008. *What is user engagement? A conceptual framework for defining user engagement with technology.* Journal of the American Society for Information Science and Technology. Volume 59, Issue 6, pages 938–955.

Pixate. 2016. *Make your ideas a reality.* http://www.pixate.com (Accessed 2016-05-09)

Polson, P., Lewis, C., Rieman, J., & Wharton, C. 1994. *The Cognitive Walkthrough Method: A Practitioner's Guide*. Usability inspection methods (pp. 105-140). New York: Wiley.

Principle. 2016. *Animate Your Ideas, Design Better Apps.* http://principleformac.com (Accessed 2016-05-16)

Quesenbery, W. 2003. *Dimensions of Usability: Defining the Conversation, Driving the Process*. Proceedings of the UPA 2003 Conference.

Quesenbery, W. & Brooks, K. 2010. *Storytelling for User Experience. Crafting Stories for Better Design*. New York: Rosenfeld Media.

Rubin, J. & Chisnell, D. 2008. *Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests*. 2nd ed. Indianapolis: Wiley Publishing, Inc.

Sketch. 2016. *Unleash your imagination*. https://www.sketchapp.com/features/ (Accessed 2016-05-09)

Wixon, D. R., Ramet, Jo Holtzblatt, K, Beyer , H., Hackos, J., Rosenbaum, S. and Page, C, Laaskso, S.A. and Laaskso, K. 2002. *Usability in practice: Field methods evolution and revolution*. CHI '02 Extended Abstracts on Human Factors in Computing Systems. Minneapolis, USA.

Appendix A Sitemap
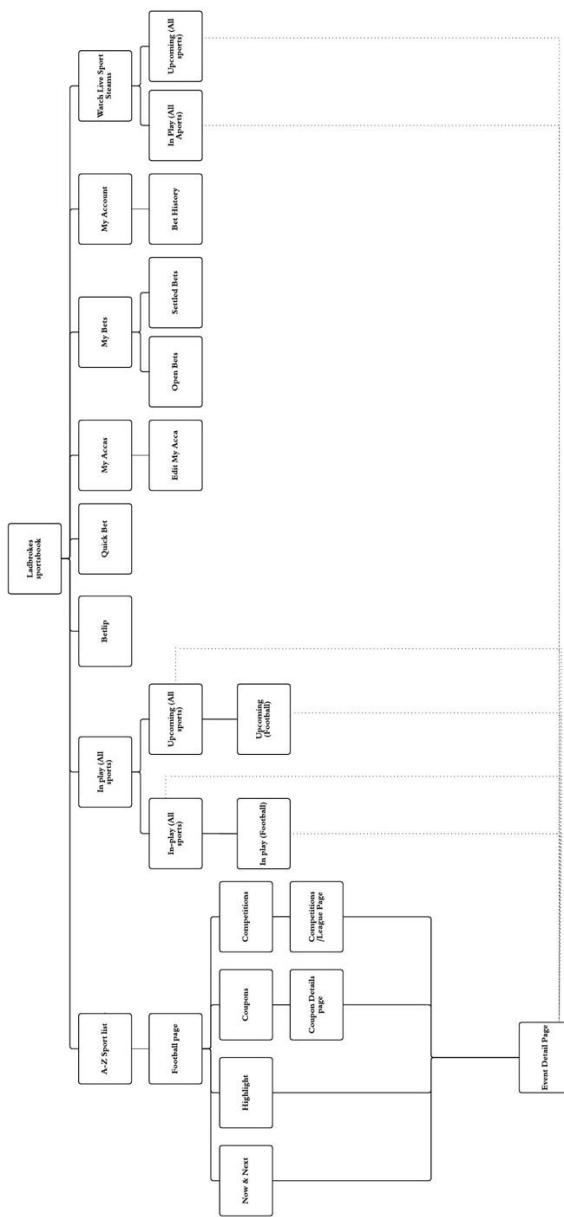
Figure A.1 Sitemap of Ladbrokes.

Appendix B Field Study

B.1 Orientation Script
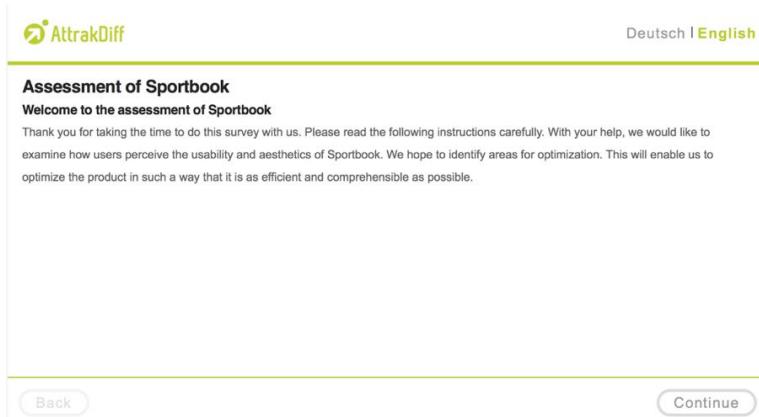
Hi,

My name is Carl and this is ChiChi (other way around, depending on who had the role of test leader). We are two students from Lunds Tekniska Högskola, doing our master thesis at a company called Mobenga, which builds sports-betting platforms. We have been asked to evaluate one of their sportsbooks, Ladbrokes, and their mobile application in conjunction to an in-play football event. Therefore, you have been invited to help us collect data on how users experience the Ladbrokes application.

To start off, I would like to ask you what previous experience you have of sports betting and which gaming operators you have used before?

During the test session I will ask you to perform two tasks. It is important to note that we are only testing the application so nothing you do is wrong and you are free to perform the tasks however you like. While you are performing the tasks, feel free to think aloud to make it easier for us to document the results. The application includes a small balance that you can use to bet for the testing purposes. Since you will play from our account I would appreciate if you play a maximum of 5 SEK per bet. Try to solve the tasks independently but you can of course just ask if you have any questions.
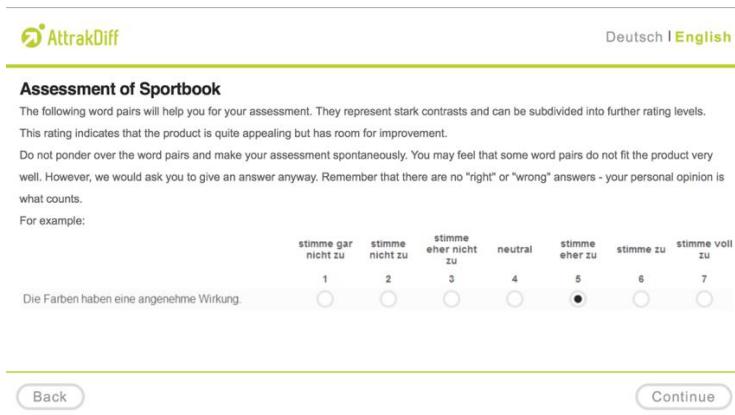
After you have performed the tasks, I want you to answer a short survey about your experience with Ladbrokes application. Finally, I will ask you six open-ended questions about how you experienced the application. Additionally, all results of the test will remain anonymous. Is it ok for us to use your results and record the screen during the test session? Do you have any other questions? Otherwise, let's begin.

B.2 AttrakDiff questionnaire

Figure B.1 AttrakDiff questionnaire page 1.

Figure B.2 AttrakDiff questionnaire page 2.

Figure B.3 AttrakDiff questionnaire page 3.

Figure B.4 AttrakDiff questionnaire page 4.

Figure B.5 AttrakDiff questionnaire page 5.

Figure B.6 AttrakDiff questionnaire page 6.

B.3 Observation notes & interview answers

	Previous Experience	Observation
No.1	Bet365, Stryktipset.	Hittade enkelt matchen ifråga. Frågade om cashout funktionen efter att ha sett ikonen vid sidan om en market. Frågade om +5 +10 när han skulle spela ett quick-bet. Frågade om competitions - var man hittade en specifik liga. Förstod add-to-slip direkt och reagerade bra på feedbacken.
No. 2	Unibet, Expekt, bet365 (bäst - använder stream, låsa spel, bättre odds, många markets), svenskaspel	Applikationen hängde sig. Quick-bet fungerade väldigt bra. Hittade även betslip direkt. Hade lite funderingar över hur man spelar ett flervalsspel. Tyckte det var lite svårt att filtrera matcher.
No. 3	Unibet (favorit - enkelt att komma åt sport, mer anpassad för webb), Svenska spel, Bet365	Now & Next första - Ser hur länge matcherna har pågått. Quick-bet fungerade mycket bra. Satsar 5 kr med hjälpknapparna. Letar efter Champions League. Hittar efter ett tag under Competitions -> European. Missar knappen för "more", måste klicka två gånger. Väljer add to slip för att spara spelet. Har problem att hitta rätt market för en match med många alternativ. Antog att en dubbel skulle ha ifylld stake om man har valt add-to-slip. Spelade 2 singlar och 1 dubbel istället för bara en dubbel.
No. 4	Svenska Spel (använder inte native, kör hemsida - liknande, samma struktur, fyrkantiga boxar och grå färg)	Hittar Premier League via competitions. Valde sedan match och tryckte på more. Försökte spela 1kr - för lite stake. Spelar 1,22. Annars fungerade quick-bet bra. Förstår inte riktigt vad kupong-menyn innebär. Använde inte snackbar med set-stake på kupong-menyn. Gick till betslip istället. Hittar betslip efter ett litet tag. Väl där hittar han multiples av en slump. Spelar två singlar istället för en dubbel.
No. 5	Bet365 - någon gång. Svenska spel för stryktipset (ingen app - bara hemsida). Ingen direkt favorit. Tradition.	Scrollar runt lite och letar efter ett bra bet. Now & Next: Kommande & nuvarande. Hittar en match. Klickar på oddsen. Förstår betslip, testade den innan quick-bet. Förstår quick-bet. Förstår markets, 31 more osv. Förstår hur man spelar kombination med hjälp av add-to-slip och betslip.
No. 6	Betsafe, svenskaspel (bara några gånger)	Scrollade på Now&Next Valde en in-play match och gick in på event detail Bläddde på information och kollade statistik innan la in bet (vilket lag som gjorde mest hörnor) Använde Quickbet på första gång att beta en single match 10 kr Gick in på Highlight och bettade en kombinationspel PSG v Chelsea och Roma och Real Madrid. Förstod hur Add to slip fungera, och valde Doubles. Kollade på Competition, Scrollade upp och ner på European UEFA Champions League Kollade op Coupons, valde Televised/Streamed Matches Undrade om det finns Streaming function
No. 7	Have used Ladbrokes before. Paddy Power, Bet365, Ladbrokes, William Hill. Experienced user.	Used add-to-slip to place bets. Played live odds that got suspended, he then changed the matches he was about to play on. No issues whatsoever.
No. 8	Betson, Stryktipset (både online och annat), spelat på hästar osv.	Did not place bet since the odds were suspended. Checked the side-menu to navigate. Used add to slip without issues. Did not notice the multiple options and tried to play three singels. Bets did not go through since the odds were suspended.
No. 9	Not much previous experience, but great football interest and experience of applications like forza football.	Lite långsam på att hitta olika matcherna. Inte säker på att han förstår de olika marknaderna. Spelade en singel och en dubbel.
No. 10	Ladbrokes - 1 till 2 år. Bytte dock till Betfair eftersom de erbjöd cashout och för att man kunde spela för mindre summor. Använder även Unibet i efter att ha gått med efter en twitter kampanj.	Navigerar väldigt lätt till rätt match. Använder add to slip utan problem när han ska spela kombinationsspel. Hittar var man spelar kombination utan problem.

Figure B7 Previous Experience & Observation data.

	How did you experience Ladbrokes?	Which feature did you like the most? Why?
No.1	Den var bra. Lik de andra jag har använt, standard.	Nej, inte direkt. Fanns dock många välmöjligheter på event detail page.
No. 2	Simpel, som alla andra betting sidor. Standard. Stack inte ut på något speciellt sitt. Odds avgör. Mer tillgänglig än Unibet. Synd att den crashade. Svårare med en annan telefon. Tog lite mer tid i början, lite omständligt med flervalsspelen - kunde varit enklare. Man ska inte behöva välja att man ska spela en trippel? - Gör det enklare på något sätt.	Enkelt att beta.
No. 3	Klurigt med kombinationsspel. Förvirrande att man kunde spela på två olika sätt. Fanns väldigt mkt competitions - största ligorna först, svår att få en tydlig översikt. Alla ligor från alla land, behöver dom till exempel visa div.4? Kanske skulle man kunna sortera bara största ligorna istället för att sortera på land.	Quick-bet var väldigt lätt och smidig
No. 4	Överlag bra struktur, inte jätte rörigt. Fattade kupongerna efter ett tag. "Lite halvtråkig design". Störde sig mest på att den är ganska långsam, den behövde ladda några sekunder istället för att allt uppdateras direkt. Man är van vid allting ska gå snabbare.	Smart med betslip, varukorg fattar konceptet.
No. 5	Bra struktur på applikationen. Lätt att utföra uppgifterna och man fick bra feedback på att man gjort rätt.	Enkel navigering.
No. 6	tråkigt interface, tyckte Ladbrokes sportsbook har inte lika många market som Betsafe, det blir mer positivt om det finns live streaming (betsafe har live om man har pengar på konto)	ingen speciell funktion som tyckte mest om, det ser ut samma som de andra sportsbook
No. 7	Fine and quite nice. I would describe it as a standard betting app.	Not really
No. 8	Väldigt enkel. Inte jätte kreativ men strukturerad. Avändarvänlig!	Ingen speciell feature.
No. 9	Couple of minutes to understand the features. It was a bit hard to find a specific match. That could have been made easier.	I like the highlights feature and that the application was not that fast so you had time to think.
No. 10	Jätte lätt att använda, kanske till och med för lätt att spela. I'm cautious about not throwing away money.	No.

Figure B8 Answers of interview question 1-2.

	Which feature did you dislike the most? Why?	If you were given more time, which part/feature would you like to check out/spend more time on?
No.1	Saknar statistik för matcher som han har mindre vetskap om.	Kollar efter mer spel. Hade kollat mer på kuponger - Kul med kuponger.
No. 2	Flervals, lite långsam.	Hur applikationen fungerar. Betta några dagar framöver, mer långtgående spel.
No. 3	Kombinationsspel och betslip. Inte så bra ikon för betslip. Blev förvirrad av highlights, tänker föregående händelser istället för något som ska visas.	Ingen speciell del.
No. 4	Inte direkt	Hade letat efter stryktips och bomben, alternativt andra kuponger.
No. 5	Ingen speciell feature, men han ogillar att det finns funktioner som "försöker luras". Till exempel att färgen blir grön när man valt ett odds. Detta beror på inställning till branchen.	Hade kanske kollat mer på olika markets om det fanns mer tid.
No. 6	Now&Next: Eventbox är lite rörligt och liten text, vill gärna ha tydligare uppdelning mellan varje in-play match. Appen var lite långsamt. Event detail: otydlig event detail (var osäker på den statistik "Shots on Target")	Daily Bet Bundles coupons (Daily big price doubles) - som offra bättre odds på några stor match
No. 7	Make it easier to switch between different parts of the page, e.g. between poker and sports.	Weekend coupons, I usually play those.
No. 8	Ingen speciell feature.	Mer live betting och mer speciella markets, t.ex antal inkast/hörnor etc.
No. 9	No, not really.	Explore markets for other sports. Try to find information about how the best "punters" bet and their betting strategies.
No. 10	A bit cluttered on the event page once a market was opened.	I have used Ladbrokes before so it is not needed.

Figure B9 Answer of interview question 3-4.

	What would you like to have, but did not find in the application?	Would you use Ladbrokes again? Why/why not?
No.1	Mer statistik. Form, senaste 5 matcherna & tabellplacering så man slipper gå till fotbollskanalen eller liknande sida. Ex, om man ska köra kupong man vill ha mer information. Viktigt om man spelar på okända matcher.	Där det är bäst odds spelar man. Lika väl på Ladbrokes som på bet365. Öppningserbjudande. Inget speciellt som sakans.
No. 2	Notifikation på levande bet (in-play) om läget ändras, till exempel om ena laget gör mål.	Gillar Ladbrokes. Hade kunnat använda igen. Oddsen är viktigast. Så länge applikationen fungerar så är det bara oddsen som är viktiga.
No. 3	Sortera ligorna på ett speciellt sätt. Personalisering, dvs ange markets eller ligor som man vill ska synas överst. Ändra standard summorna från 5,10,20,50. Man kanske vill betta mer. Damfotboll?	Ja. Om det är bra erbjudande. Jobbigt med överdriven säkerhet från svenska spel. Mer reklam gör så att man byter? Video highlights för matcherna, kolla appen Forza.
No. 4	Kommer inte på något spontant.	Hade jag kunnat göra, ganska lätt att spela. Fanns även många markets att spela på.
No. 5	Möjlighet till social kommunikation. Klotterplank, chat eller forum. Rekatochklart till exempel. Tips om bet - man får andras åsikt. Till exempel tänk på det här och det här om denna matchen.	Absolut. Har kontroll över spelandet. Det var enkelt att lägga bets. Bättre än stryktipset, så hade dom haft stöd för den kupongen hade han använt Ladbrokes istället.
No. 6	vill ha live streaming, undermenu på huvudmenu "football(som Betsafe)" för att skippa så många navigation (eftersom vill leta på stor specific match/league, betsafe har undermenu i sitt huvudmenu)	Nej, eftersom ingen livestreaming. Navigation är lite jobbigt, speciellt när man vill betta live
No. 7	I will just use the application for betting, don't need anything else.	I choose the operator who gives the best odds and free bets, if Ladbrokes does it I will use it. I get information regarding offers by email.
No. 8	Kommer inte på något spontant som hade varit bra att ha.	Ja. Den var lätt använda. Till en viss nivå spelar marknadsföring en stor del, men man känner till de stora spelarna Bet365, Unitbet etc så det spelar ingen roll mellan dom så länge allt fungerar. Jämför inte kampanjer / odds. "Trogen användare".
No. 9	A search feature would be very nice. If it could display some more statistics like forza football it would be nice. I also miss the customization that is offered in Forza Football, you should be able to favorite competitions, teams and players.	Yeah I would use it. It was quite nice and fairly simple to use.
No. 10	Nothing.	Not really - don't want to change application and go through the hustle of entering bank-information again. The most important things for me is exciting odds and cashout.

Figure B10 Answer of interview question 5-6

Appendix C Cognitive Walkthrough

C.1 Correct actions

Task 1: Place a bet on any in-play event, and validate that it has been placed.
Action sequence:

1. Press odds

2. Enter stake

3. Press place bet

4. Read and close receipt

Task 2: Place a bet on a upcoming event in Segunda Liga, and validate that it has been placed.
Action sequence:

1. Press competitions

2. Press Spanish

3. Press Segunda Liga

4. Press odds

5. Enter stake

6. Press place bet

7. Read and close receipt

Task 3: Use the bet coupon Goal Crazy and place a treble bet.
Action sequence:

1. Press coupon

2. Press Goal Crazy

3. Choose several bets

4. Press set stake

5. Enter stake for Trebles

6. Press place bet

Task 4: Place several bets, using the bet slip, on an upcoming event from the premier league.

Action sequence:

1. Press competitions
2. Press premier league
3. Press event name text or X more > text
4. Press odds
5. Enter stake
6. Press add to slip
7. Select multiple odds
8. Press betslip
9. Enter stake for all markets
10. Press place bet

Task 5: Use the bet coupon English Matches and place several bets on the market Both Team to Score (BTTS).

Action sequence:

1. Press coupon
2. Press English Matches
3. Choose "Both team to score" on the drop down menu
4. Choose several bets
5. Press set stake
6. Enter stake on each bet
7. Press Place bet

Task 6: Place a bet on an upcoming event and cash out the stake, then verify the cash out on the settled bets page.

Action sequence:

1. Press event name text or X more > text
2. Select market with cash out option
3. Enter stake
4. Place bet
5. Go to My Bets
6. Press cash out

7. Press done
8. Press settled bets
9. Verify cash out

C.2 Success and Failure stories

C.2.1 Success stories

Task 1: Place a bet on any in-play event, and validate that it has been placed.

Success story: Place a bet on any in-play event, and validate that it has been placed.

Defense of credibility:

- The user always tried to achieve the correct effect since the application told them to do it and that the user had previous experience of smartphones.
- All buttons had good visibility and some were even color coded.
- All buttons had a correct text description.
- All actions provided clear feedback.

Task 2: Place a bet on a upcoming event in Segunda Liga, and validate that it has been placed.

Success story 1: Place a bet on a upcoming event in Segunda Liga, and validate that it has been placed.

Defense of credibility:

- The user always tried to achieve the correct effect since the application told them to do it and that the user had previous experience of smartphones. The user also had knowledge about the competitions and events.
- All buttons and tabs had good visibility.
- All buttons and tabs had a correct text description. In addition, the titles were also correct.
- All actions provided clear feedback.

C.2.2 Usability issues

C.2.2.1 The coupon feature
Task 3, action 3 and Task 5, action 3

Criterion: If the correct action is performed, will the user see that progress is being made toward solution of their task?

Example: If the user bets multiple on outcomes for the same match, no feedback is given that this is an erroneous action.

Failure story: User did not realize that multiple bets could not be placed on the same match and when included in the coupon.

Task 3, action 4 and Task 5, action 4

Criterion: Will the user notice that the correct action is available?

Example: The odds is still marked as green but the bottom bar disappears.

Failure Story: User did not realize that multiple bets could not be placed on the same match and when included in the coupon.

Task 5, action 3

Criterion: Will the user notice that the correct action is available?

Example: The user did not notice the drop down menu and instead pressed the back button.

Failure story: The user did not use the drop down menu to change market.

Task 5, action 3

Criterion: Will the user associate the correct action with the effect they are trying to achieve?

Example: The user did not use the drop down menu and instead pressed the headline.

Failure story: The user did not understand the abbreviations.

C.2.2.2 The design of the event box
Task 4, action 3 and Task 6, action 1

Criterion: Will the user notice that the correct action is available?

Example: No obvious button was displayed.

Failure story: User did not realize where to click.

Task 4, action 3 and Task 6, action 1

Criterion: Will the user associate the correct action with the effect they are trying to achieve?

Example: User tried to click the kickoff time for the upcoming match.

Failure story: User did not realize which parts of the event box that was clickable.

The add to slip feature

Task 4, action 6

Criterion: Will the user notice that the correct action is available?

Example: User clicked place bet instead of add to slip.

Failure story: The user did not notice the add to slip functionality since the place bet button is green and steals focus.

C.2.2.3 Betslip visibility

Task 4, action 8

Criterion: Will the user notice that the correct action is available?

Example: The user pressed my bets.

Failure story: The user did not realize that he should press bet slip in order to place bets.

Appendix D Formative usability test

Task 1: Add John as new friend

1. Press My Account icon
2. Press Friends
3. Press/swipe to Find Friends
4. Search John by typing the username in the search box
5. Press Add Friend button

Task 2: Create a league named "Test-League" and invite John to participate

1. Press My Account icon
2. Press Leagues
3. Press Create League
4. Enter League details
5. Invite John to join the league
6. Press Create-League button

Task 3: Enter Bets for the first round of "Test-League"

1. Press My Account icon
2. Press Leagues
3. Press the name "Test-League".
4. Make selections on the "Bets-menu"

Task 4: Create a challenge for an in-play football match

1. Find football event
2. Press Betslip button - floating action button
3. Press Challenge button - small pop-up floating action button
4. Enter stake
5. Select opponent
6. Press place challenge

Task 5: Accept a Challenge

1. Press My Account icon
2. Press Notifications
3. Press Challenge in notifications menu
4. Select odds
5. Press Challenge

Task 6: Vote a poll during an in-play match

1. Find an in-play football event
2. Press event name
3. Press Yes / No in the poll section.

Task 7: Answer quiz during an in-play match

1. Find an in-play football event
2. Press event name
3. Press start quiz
4. Answer question 1
5. Answer question 2

Appendix E Summative test

E.1 Orientation Script

Hi,

My name is Carl and this is ChiChi (other way around, depending on who had the role of test leader). We are two students from Lunds Tekniska Högskola, doing our master thesis at a company called Mobenga, which build sports-betting platforms. We have developed a prototype with several new features. League - betting with your friends, Quiz - halftime entertainment during half time break.

You have been invited to help us to test and evaluate the prototype. All results of your test will remain anonymous. Is it ok that we record the screen and sound?

Thank you!

During the test session, I will ask you to perform six tasks. After you have performed the tasks, I want you to answer a short survey about your experience with the prototype. Finally, I will ask you 5 questions in regards to the prototype. Do you have any questions? Otherwise, let's begin.

E.2 Performance data & interview data

Performance data

	No.1- Expert	No.2 - expert	No.3- Expert	No.4- Intermediate	No.5 -novice		Average	Standard deviation
Time to complete a test (s)								
Task 1	16	57	19	35	55		36	17
Task 2	12	36	12	12	34		21	11
Task 3	21	16	10	33	15		19	8
Task 4	47	14	37	28	42		34	12
Task 5	25	16	15	25	38		24	8
Task 6	24	60	67	60	63		55	16
Number of errors							Sum	
Task 1	0	2	0	1	2		5	
Task 2	0	3	1	0	3		7	
Task 3	1	0	0	2	0		3	
Task 4	0	0	2	0	0		2	
Task 5	0	0	0	0	0		0	
Task 6	1	1	7	2	1		12	
Number of hints							Sum	
Task 1	0	0	0	0	0		0	
Task 2	0	1	0	0	0		1	
Task 3	0	0	0	0	0		0	
Task 4	0	0	0	0	0		0	
Task 5	0	0	0	0	0		0	
Task 6	0	2	1	2	1		6	

Figure E1 Performance data of summative test.

Interview data

Interview questions	No.1- Expert	No.2 - expert	No.3- Expert	No.4- Intermediate	No.5 -novice
Q1- Overall experience? Vad tyckte du om applikationen?	gillar applikationen enkel att använda, man fattar snabbt funktionerna, tyckte uppgifterna var sammanhängande	Den såg annorlunda ut jämför med det som redan finns. Positiv att ha lite nytt. Simpel att handskas med.	Jävligt bra - enkelt att hitta och det var logiskt. Profile och leagues var enkelt.	väldigt enkelt, layouten är väldigt snygg, bättre intryck av att spela, allting är väldigt responsive,	Tycker applikationen är snygg - man förstår knappar var man kan tycka eller inte tycka. gillar upplägget. En del problem eftersom han inte har domän kunskap, alla termer var lite främmande osv
Q2 - Which of the features did you like the most? Why?	Quiz är roligare, gör att folk vill stanna kvar eftersom pausen brukar vara ganska tråkigt så det är kul att någonting att göra under pausen, man får nya frågor i nya matcher. Bra att den var knuten till en speciell match.	Ligan - det är roligare att möta någon man känner, satsa mot varandra än att svara på frågor eftersom det finns redan i andra appar, t.ex. Spelet - Forza	League- roligare att kunna spela mot polare, vinna deras pengar, skapar mer hets (Quizen är lite mer lättsam - bara gå in och klicka , underhålla sig själv.)	Quiz är roligare - tidspress bra att kunna fördriva tiden, mer intuitiva, mer färgglada, Implementation gör att quiz blot bättre. (Ligan var lite mer komplicerad eftersom det kräver för många klick för att komma in i league sidan Konceptet med league gör att betting blir mycket roligare att kunna tvåla mot kompisar, det finns inte på någon betting webbsidan)	Quiz - Krävs inte så mycket går snabbt att fixa, mer saker att fixa om man ska ha en liga.
Q3 - Do you think that this type of feature is suitable for a sportsbetting application?	Ja, det passar in i betting applikation, vilket kan dölja den pengartjänande känslan som spelbolaget ha, inte bara spotta bet på folk	Ja, det passar in i en betting lösning. Känner till många vänner som tycker om sitter var sitt håll och spela mot varandra. Det hade varit kul att de kunna skapa ligor på detta sättet.	Känns naturligt att ha dess features i betting app. Halvtidsunderhållning känns också bra. Båda två känns rimliga.	Ja jag tycker att dom passar in.	inte konstigt, roliga inslag.
Q4 - Do you think the features improves the application?	Negativt för dom med spelberoende. Kanske mer positivt iaf. Vill testa mer eftersom det är roligare feature	Denna typer av funktioner kan absolut förbättras sportpetting app.	Båda funktionerna förbättrar applikation. Inget man måste göra som bara extra alternative som man kan göra om man vill.	Ja, dom förbättrar upplevelsen - mer mänsklig touch. Allt handlar inte om pengar. Mer socialt.	-
Q5 - Would these features make you reuse the application? Why?	De två nya features är intressenta, leagues behöver lägga lite mer tid att behöv uppdatera hela tiden däremot quiz är kul och snabb entertainment	Absolut, det känns mer socialt sätt att spela.	Jag skulle inte vara den första att starta en liga. Hade varit en rolig grej - svara på hans bet och bli utmanad. Det verkar intressant och roliga funktioner.	Sportintresserad - hade ökat användning, quiz gör att det blir bättre tidsfördrivning mellan pausen. League - det händer ofta att man vill köra en runda mellan sina kompisar som är också fotbollsintresserad, det brukar vara handslag så det är bra att det finns allting på papper	Detta hade kunnat bidra till att man använder appliaktionen mer

Figure E2 Interview data of summative test.

100