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**Design of a user interface for a social billiards application  
for mobile operating systems**

Thesis work

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## **Thesis abstract**

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The functional thesis consists of the design of a billiards application for mobile operating systems. A user interface was designed for a new and innovative social billiards application.

The design of the user interface for the application is based on the theory of mobile interface design, presented in the thesis. The thesis outlines the best practices to promote billiard sports, the market area for billiards applications and the history of the mobile application industry. The core idea of the application is described as the basis for designing the user interface. The thesis also analyses the research environment in the mobile application industry and the competitors of the billiards application.

Based on the results of the thesis, it will be possible to develop the billiards application with a team of programmers into a finished product and to search financiers for the publishing and maintenance of the application. Competition in the application industry is high, but for a suitable niche products such as the one here designed, there should be room to succeed.

The result of the thesis is a complete user interface to implement on a billiards application. If the application is advanced in the future, the decision between developing the application through a third party or developing it independently, by gathering a suitable team and financiers, needs to be made.

Keywords: mobile application, user interface, billiards

SEINÄJOEN AMMATTIKORKEAKOULU

## Opinnäytetyön tiivistelmä

Koulutusyksikkö: Liiketalouden, yrittäjyyden ja ravitsemisalan yksikkö

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Tämä toiminnallinen opinnäytetyö on biljardisovelluksen suunnittelu mobiiliin käyttöjärjestelmään. Työssä suunnitellaan käyttöliittymä uuteen innovatiiviseen sosiaaliseen biljardisovellukseen.

Biljardisovelluksen käyttöliittymän suunnittelu perustuu työssä esitettyyn teoriaan käyttöliittymien suunnittelusta. Työssä määritellään parhaita käytäntöjä biljardi-lajin edistämiseksi, biljardisovelluksen markkina-alue sekä mobiilisovellusalan historia. Sovelluksen idea esitetään pohjana sovelluksen käyttöliittymän suunnitteluun. Työssä hahmotellaan mobiilisovellusalan tutkimusympäristöä sekä biljardisovelluksen kilpailijoita.

Suunnittelun tulosten perusteella kyseistä biljardisovellusta on mahdollisuus kehittää ohjelmointitiimin avulla valmiiksi kuluttajatuotteeksi sekä etsimään rahoittajia sovelluksen julkaisuun ja ylläpitoon. Kilpailu mobiilisovellusmarkkinoilla on kovaa mutta sopiville niche-tuotteille kuten suunnitellulle sovellukselle tulisi olla tilaa menestyä.

Työn tuloksena on valmis käyttöliittymä biljardisovelluksen toteuttamiseen. Mikäli sovellusta päädytään kehittämään jatkossa, on päätettävä, annetaanko sovelluksen kehittäminen kolmannelle osapuolelle vai kehitetäänkö sovellus itsenäisesti keräämällä siihen soveltuva ryhmä ja rahoittajat.

Avainsanat: mobiilisovellus, käyttöliittymä, biljardi

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# 1 INTRODUCTION

The aim of this bachelor thesis is to develop the first steps of creating a complete functioning and profitable mobile application (app). Since the scope of creating a complete application in all of its aspects is outside the scope of a Bachelor thesis, the focus of the thesis is on the design of the user interface of the application, including a presentation of theories related to the subject. The target of the application, of which the reader shall be learning a lot in the following pages, is billiards.

This idea for a unique mobile billiards application started forming since late 2011 and over time it has become clearer what the core essence of the idea is and how it really is something that has never before been done. Instinctively, more and more information has been searched about similar projects. Altogether, research into the many aspects of application industry, mobile user interfaces and technology that is needed for the application has been done. In the thesis, however, for the first time something real will be created, something concrete that will pave way to realizing the application.

The creation of a new type of application is a huge challenge. For that reason, the reader should become convinced that with the presented plan of the design and with the accompanied justifications for it, not only the thesis is a success, but also the creation of the application itself is going into the right direction.

The working name for the application is "NextShot Billiards".

## 2 BACKGROUND

In this chapter, the background to this thesis will be presented by comparing the planned application with other projects that share similarities and core features. Also, the theoretical background with a short history and rules for mobile interface design are presented.

Billiards is a game a great number of people have heard of, and many have tried it at some point in their lives. In addition to being a popular pastime for millions of people who regularly visit their local poolrooms, it is also a high-level competitive sport with 2 090 registered players in Finland over 34 000 in Germany and over 300 000 registered league players in the USA (Suomen biljardiliiton lisenssioimat pelaajat [Ref. 8 February 2013]; DOSB | Bestandserhebung 2012, 9; APA Pool, [Ref. 8 February 2013]; Membership information, [Ref. 8 February 2013]; VNEA History, [Ref. 8 February 2013]). What makes the sport so interesting at first hand is that almost everyone can play it, from a child to a grandmother to a person in a wheelchair, and, secondly, that it is always possible to learn something new to improve one's game, no matter at which level a player currently is playing. These aspects come together forming a huge market, a huge "billiards playing public". This can be seen in how many instructional books, DVDs and other gadgets to help improve a billiards players game have been invented during the over 500 year history of the cue sports (cf. Everton 1986, 8–11). Moreover, a search with Google Patents for "billiard" finds as of 8 February 2013 approximately 57 700 billiards- related patents.

### 2.1 Best practices and inspiration for NextShot Billiards

Thanks to the technical improvements of today, it is easier and easier to find valuable information online on how to become better at billiards. Two of the many relevant Internet sites that are there to provide tools for informed billiards players are EasyPoolTutor.com and CueTable.com.

The EasyPoolTutor provides aspiring billiards players a community to share their tips, provides advice and altogether displays a comprehensive picture of billiards

as a whole. The EasyPoolTutor has in its forum over 3 000 members and is a completely free learning platform for billiards players (Learning to Play, [Ref. 8 February 2013]). Getting acquainted with the platform will make a person understand how important the community and the aspects of sharing and communication are for billiards players. Altogether, there are almost no billiards sites without an active forum. For example, the billard-aktuell.de forum in Germany has over 6 400 members and azbilliards.com forum in USA over 40 000 members (AzBilliards Forums, [Ref. 8 February 2013]; Learning to Play, [Ref. 8 February 2013]). These two countries are also the markets that will be the focus for NextShot Billiards app.

1. USA                      Largest billiards audience with plenty of purchasing power
2. Germany              Largest European billiards audience with good organization

In addition these countries have a high smart phone penetration rate, which is crucial since the application can be played only with smartphones and smart gadgets (cf. Our Mobile Planet 2012).

The CueTable, on the other hand, is a collection of billiards “diagramming and visualization software“, for billiards players to share their moments on the billiards table; it is hosted by pool.bz (Pool & Billiards Online FAQ, [Ref. 10 February 2013]). In addition, pool.bz also includes a social network, which is similar but smaller as in EasyPoolTutor and focused on sharing billiards situations. Often, a big part of a billiards game is talking with the opponent about the key shots of the game or telling friends about the amazing shots and funny situations at the table. For that, a computer program was invented as early as 1997, WeiTable, which allows one to “draw” their shots and share them with friends, with the friends naturally complementing their shot selection or telling better ways to solve the solutions on the table. Since 1997, billiards visualization software has been refined and broadened and other complementing tools have been invented. The team behind CueTable has then again gathered these programs together and created the opportunity to use these diagrams in blog posts, forum posts, emails, practically everywhere on the web. The CueTable programs are free to use.



The NextShot Billiards application will be based on the combination of ideas from both the EasyPoolTutor and CueTable, transformed into the technology of today, and especially conveniently to a device which is always close by, the smartphone. It will be a completely new experience for the billiards world and it will change the way billiards can be learned, shared and experienced. There is no such tool for pool players on the market, and the application would hopefully turn out to be a “must” for all serious players as well as the general billiards playing audience. This interaction of pro- and regular players will surely provide new dimensions for the billiards sport in general while, at the same time, involving the broader general audience is deemed to provide a greater market for the application.

## **2.2 History of mobile application industry**

According to Fling (2009, 3–12), “the historical context of how we arrived at the mobile technologies of today” is best explained with the five eras of devices: the brick era, the candy bar era, the feature phone era, the smartphone era and the touch era.

The brick era (1973–1988) introduced the first telephones that were cordless and genuinely portable though also expensive and huge, brick-like, since connecting to the few and rare mobile networks of that time enormous batteries was needed (Fling 2009, 3–12). The phones of the brick era were not suited for the majority of people. The candy bar era (1988–1998) changed this, what was once a luxury item turned into something a normal person could use conveniently on the pocket and obtain due to the rising economic prosperity of those times, the candy bar referring to the shape and size of a new brand of devices. At these times the network operators realized the possible huge profits to be gained from mobile telephoning and started to build more and more cellular sites, which in turn decreased the need of big batteries in mobile phones. Additionally during the candy bar era it was realized that mobile phones were able to do more than just voice calls, namely the SMS (Short Message Service) was included in the second generation (2G) networks for operator notifications, and from there to the person-to-person text messages of today. The Feature phone era (1998–2008) added even more new

features for the mobile phones, such as music players, camera and very basic internet functions, but the mobile phone experience did not change until the smartphone era. The smartphone era is said to have started from around 2002 and going on to the present. While there is no clear definition of a smartphone, certain common similarities of smartphones are said to be a larger screen size, high-speed wireless connectivity, Wi-Fi for example and QWERTY keyboard or a stylus for input. The era worked as a bridge for the fifth and final era of mobile phones and introduced such inventions as Palm OS- based PDA's, the Blackberry and the Symbian OS. The final era, introducing the latest mobile technology so far is the touch era from 2007 to current day. The touch era started from the introduction of the iPhone. The iPhone created a new perception of a mobile phone, something that was not a phone or a computer, but instead a new medium entirely. Most importantly for this thesis, the iPhone popularized applications with its iTunes App Store, which had seen just six months after its launch in July 2008 over 300 million apps downloaded.

Mobile devices of the Touch Era are a completely new medium capable of offering real people new and exciting ways to interact and understand information. The devices of tomorrow will be able to leverage location, movement, and the collective knowledge of mankind, to provide people's lives with greater meaning. (Fling 2009, 12)

### **2.3 Theory of mobile interface design**

Now that it is known how the mobile application came to take place it is time to introduce theory for designing an application and more concretely the interface of an application.

Schneiderman and Plaisant (2005, 74–76) describe the “eight golden rules of interface design” as a starting point for interface designing in many areas. As the rules are supposed to be a starting point, have Gong and Tarasewich on their study paper (2004, 3751–3755) tuned and expanded these basic principles to better suit to the particular needs of mobile interface design. Gong and Tarasewich have left four rules without modification, modified another four rules and added seven additional rules in so creating a total of 15 rules for mobile interface design. The rules that according to Gong and Tarasewich are useable to mobile devices

without changes are to enable frequent users to use shortcuts, to offer informative feedback, to design dialogs to yield closure and to support internal locus of control.

To enable frequent users to use shortcuts means providing the possibility to increase the pace of interaction as the user gets more trained in using an interface (Shneiderman 1998, 74). This rule has been changed in the 2005 edition to a new name “cater to universal usability”, thus expanding the original idea of the rule from beginner-advanced viewpoint to the general diversity of users such as age and technology experience (Shneiderman & Plaisant 2005, 74). To offer informative feedback means that the user should be notified when he interacts with the interface. As to how this feedback is to be done, are two ground rules given: in frequent and minor actions, the feedback should be minimal and in major and non-frequent actions more substantial. Offering informative feedback should give the user confidence in using the interface (CS 2010, [ref. 4 March 2013]). Designing dialogs to yield closure is also a form of feedback (Shneiderman & Plaisant 2005, 75). The interface should be designed so that sequences of actions have a clear beginning, middle, and end with relevant feedback for finishing each stage. This structure will give the user a sense of accomplishment and signal the preparation for the next group of actions. Such a structure is often seen in e-commerce, from selecting a product to checkout. And lastly, to support internal locus of control is essentially to design the interface so that the user will feel in charge of the interface and that there is nothing that would deviate from this feeling of control, such as surprising interface actions, and in so causing the user anxiety and dissatisfaction.

The other four rules that according to Gong and Tarasewich (2004, 3752–3753) need modifications for the specific use in mobile device are to strive for consistency, to prevent errors, to permit easy reversal of actions and to reduce short-term memory load.

To strive for consistency on the interface according to Shneiderman and Plaisant (2005, 74) means that both the sequences of actions and terminology as well as layout and design have to be consistent and that inconsistencies have to be minimal and comprehensible. Gong and Tarasewich (2004, 3752) have modified this rule to contain parts that are important to be consistent in the case of mobile user

interfaces especially. They say that the interface should be consistent also across multiple platforms and devices, that the appearance should be similar between particular mobile and desktop counterpart interfaces in terms of colors, names and dialog, and finally that input/output methods should be consistent and not tied to a specific mobile platform. To prevent errors rule means that the user should not be able to make serious errors, no matter what the user does with the interface. An example is given: if a user fills in a form and makes a mistake while filling it, after submission of the form the interface should guide the user to repair only the mistake, and not the whole form; “erroneous actions should leave the system state unchanged”. The modification or addition to this rule on a mobile device is that nothing harmful should happen if the user triggers a too simple an operation, such as power on/off, by accident. This modification is due to faster pace of events and close proximity of buttons on a mobile device. To permit easy reversal of actions means that actions should be reversible as much as possible. When a user knows that errors can be reversed, he has more freedom to try out the interface and less anxiety of errors. Addition to this rule is that network connection should not be relied too much on a mobile application since losing the connection makes reversal of actions more difficult. To reduce short-term memory load is directed to the user of the interface. Since a normal human short-term memory is not so huge, the interface as well as the displays is to be kept simple, sufficient time is to be given for sequences of actions, and windows-motion frequency is to be reduced. Additionally Gong and Tarasewich add that recognition of function choices is preferable to memorization while using an interface and that using modalities is advantageous to convey information on a mobile platform.

The seven additional guidelines from Gong and Tarasewich (2004, 3753–3755) are specific for mobile device interface designing. The first guideline is to design for multiple and dynamic contexts, meaning that the interface should be customizable by the user to their needs and preferences, single- and no-handed operations should be made possible and that the application should be made to self-adapt to users changing environments and activities. The second guideline is to design for small devices. Thirdly design should be done for limited and split attention, meaning that interfaces should not require too much attention when using them. The fourth guideline is to design for speed and recovery, which means that

applications should open without a delay and that stopping and resuming applications can be done swiftly. The fifth guideline says that interfaces should be designed for “top-down” interaction; to show the user in the beginning only top level information with the chance to dig deeper if the user so chooses. The sixth guideline is to allow for personalization, since a mobile device is normally used by one person only and that people might have their own preferences for using the interface such as different skill levels and usages. The seventh and so the final guideline is to design for enjoyment; even though usability and functionality are critical for an interface, an application that is fun and looks good will stand out.

### 3 RESEARCH ENVIRONMENT AND METHODS

In this chapter the research environment including competitors, as well as methods for designing the application are presented.

#### 3.1 Research environment

The research environment for the thesis revolves around the mobile application industry, an industry that is relatively new and has been growing in the recent years in such amount that it is today considered to be a booming industry. What really started this industry to bloom was the introduction of Apple App Store for iPhones and other Apple devices in 2008. By the end of 2008 the App Store was reaching 10 000 available apps, by 2010 it already had over 100 000 available apps and now in 2013 with over 800 000 available apps and over 45 billion app downloads to date it has truly been a success story (Apple Reports 2008; Apple Updates iOS 2010; Sneak Peek 2010). In terms of money has the Apple App Store earned \$12.8 billion in its lifetime, from which application developers have received \$9 billion and Apple \$3.8 billion since it taking 30% of the revenue (Apple Earnings Call 2013). Even more amazingly, over ten per cents of this revenue, \$1.48 billion was gained between January and March 2013 (Yang 2013). To grasp a feeling for the size of the industry and importance of Apple in it, the total revenue from app stores in the first three months of 2013 was \$2.2 billion Apple generating 74% of it and the next biggest player Google with its Play Store generating 18% share of this revenue. From \$15 billion in 2012 is the global revenue from app stores expected to rise to \$25 billion or 62% in 2013 (Lessin & Ante 2013). For comparison, the total trade value of Global recorded music industry revenues in 2012 was \$16.5 billion, up 0.3% from 2011 (Smirke 2013). In other words, 2013 will be a year when mobile application industry grows to become bigger than the Global recorded music industry.

The most valuable and the most needed players in the application industry are the people creating apps. Without apps, would iPhone and iPod and whatnot be only shells with no content. The apps are also the single one revenue generating mer-

chandise in the whole industry that is to grow bigger than recorded music industry. But, like also music has to be printed on a cd or distributed over the internet, the apps need their distribution channels, in which as in the previous chapter came clear is Apple is the number one at the moment. And so an app creator has to understand that from his sales a percentage belongs to the distributor (Mackenzie 2012). The big app stores, Apple, Google and Microsoft each take 30% of the revenue and while there might be smaller app stores taking less percentages, it also means that these smaller stores have smaller distribution networks. Ideally a created app would be distributed in as many distribution channels as possible, but since that requiring increasing amount of capital, time and work, mostly coding for different platforms; iOS, Android, WP8, is that often not possible or feasible in the beginning. Rather deciding on one channel to see if the app is successful and then expanding from there might be a more workable solution.

Now having gone on the research environment through the size of the mobile application industry and its distribution channels and who profits from the apps, it is time to see the most important aspect; how the revenue from mobile applications are generated, or what the business models in the application industry are. The business models for an application creator in the application industry are multiple and new ways to monetize applications are thought out as we speak (Laurs 2011). Still there can be seen four main ways to make money out of a mobile application. The four business models are paid, advertisement supported, virtual goods and subscriptions. More than 90% of application revenue is created using these business models. The following chapter will present the four business models.

The business model paid is simple to explain. One sells his application for a certain price using one of the distribution channels, such as Apple's App Store and receive the money from the sales (Laurs 2011). 80% of the app revenue came from paid apps in 2011. Advertisement supported is also an option. In that case the app creator offers his app for free but with advertisement included. The advertisement will come from an ad network such as InMobi. The ad network will in turn pay the app creator a percentage of the money they receive from their advertisers. An app creator might receive for example \$1 CPM, meaning a dollar for thousand advertisements viewed. And not to forget, not only the ad agency, but also the dis-

tribution channel will both take their share of the revenue generated. 12% of app revenue came from this model in 2011. A third business model is selling virtual goods. The idea with virtual goods is to distribute the application for free and to offer paid services in the application. These paid services can be anything the application creator thinks of; including and not limited to virtual items, extra services or features. The fourth main business model, subscriptions, does not account to a big percentage of the entire revenue from applications, but single applications that use it successfully can create huge and continuous revenue streams. Subscriptions mean that the users subscribe to the service the application offers and continue regularly to pay a fee of the services. For example the iPhone app for The Wall Street Journal has a \$13 monthly subscription and the Windows Phone app for Nokia Music+ a \$4 monthly subscription fee (Delaney 2013; Mobile Products 2013).

It is worth to note that these four models are all combinable (Laurs 2011). Why not create a paid app with advertisement, possibility to buy the virtual good of removing the advertising and offering a monthly subscription for VIP news, or offering some other clever combination. The prognosis for 2014 says that paid apps will create half of the app revenue while advertisement supported apps rise to take 30% and the remaining 20% coming from virtual goods, subscriptions and other models, for example cross selling and data collection.

Now that the business models have been explained, comes the question which one to choose. To answer this question a good solution is to look at the “US” model (Laurs 2011). The model compares utility of the application versus stickiness of the application to decide a business model for an application to create the biggest revenue. The utility of the application in this model means how much entertainment or productivity value one engagement with the app brings to the user. Stickiness on the other hand measures how long an app will keep the user engaged. A simple game might have a low stickiness if the user is supposed to play only a couple of times while more complex game like Angry Birds can keep the user engaged for weeks or months. Highly sticky applications such as Facebook, Nokia Music or Gmail can keep the user engaged for years. A standard US model can be seen in Figure 1.



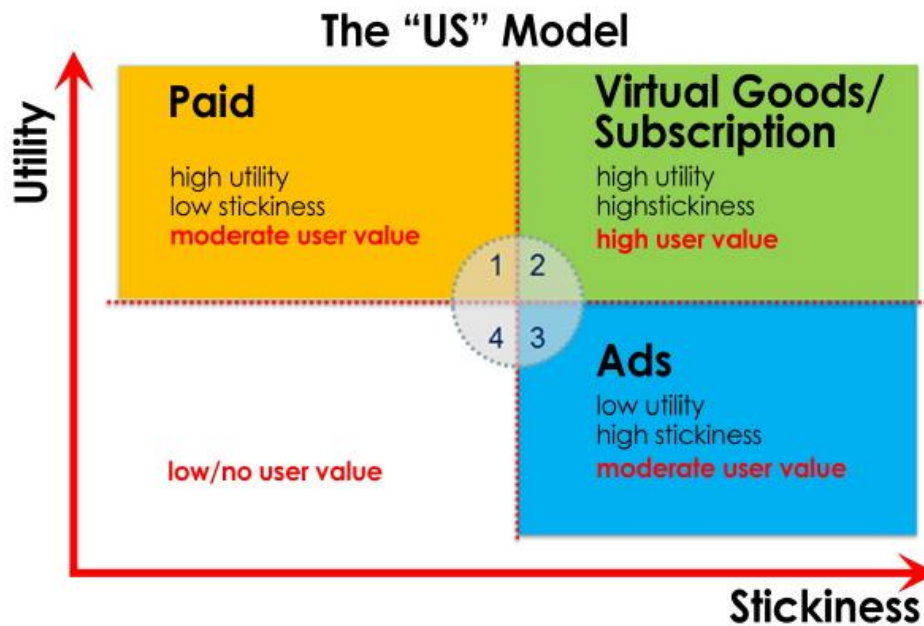


Figure 1. The utility vs. stickiness model (Laurs 2011).

From Figure 1 can be seen that depending on the stickiness and utility of the application it can be placed on three different quadrants since an app in the fourth quadrant would not have a reason to exist (Laurs 2011). The business model choice for an app in the first quadrant, high utility but low stickiness, would be paid. This is easily understandable since if an application has low stickiness, it would create only a small amount of advertisement views and it would not interest subscribers looking for years of content. However since the app will provide the user with high utility, such as a good short game would, should the user be willing to pay to get the application. The third quadrant describes the opposite situation; the user does not receive high utility from the app, but the app is highly sticky, such as weather applications. In this situation the choice for business model would be advertisement supported. Lastly, if an app is lucky enough to land on the second quadrant, the single user value of the app can rise to tens or hundreds of euros with the use of virtual goods and subscriptions as a business model. With high utility and high stickiness the user is ready to pay for the app on an ongoing basis. An example would be newspaper app subscriptions and social games, such as the one being developed in this thesis work.

Finally it has to be mentioned that out of the multibillion dollar application industry, big players such as Facebook or Angry Birds are making the lion's share of profits, while many small app creators keep struggling (Lessin & Ante 2013). It is tough to

break into the business as a newcomer, “only 2% of the top 250 publishers in Apple’s App Store are “newcomers”. A current trend seems to be pointing for creating apps more selectively and also searching for niche markets to target.

### **3.2 Competitors**

In this chapter the current competitors for a billiards application in mobile devices are presented.

Although the idea for the billiards application designed in this thesis is completely unique, will the presentation of successful and if not directly, surely indirectly competing billiards applications be useful in supplementing the realization of the current market situation facing billiards applications. For the competitor analysis have been selected five different billiards applications for iPhone available at Apple’s App Store: Pool, Killer Pool, Billiard Rules, Break Speed and MySnookerStats. An important criterion for the selection of the five applications has been that they present the wide variety of billiards applications available.

Let us start with an application called Pool created by Byterun. Pool is an app distributed for free (\$0.99 when it was released) (Byterun 2012). It has 13 601 customer ratings with an average of four stars out of five. It was released 2009 and the latest version is from 2012. The app allows the player to play 8-ball pool against the computer or another human player on the same mobile device. The playing mode in the app is from a fixed ceiling perspective and it has very minimal graphical appearance. The app is so to say a stellar, basic billiards playing app with limited features.

The Killer Pool from Sauce Digital Limited costs \$1.99. It has 410 customer ratings and three and a half stars (Sauce Digital 2013). It advertises itself as “the most realistic pool experience on the iPhone”. It was released in 2010 and lastly updated in 2013. The app allows the user to play five different games: 8 ball, 9 ball, UK black ball, killer and octokiller. It features plenty of customization options, local and internet multiplayer game modes, tournament series, advanced controls, official rules and many other features. The playing mode has an adjustable camera angle

from the shooting perspective of the player. The app could be described as a feature rich billiards playing app.

Now having gone through two of the many applications focused on playing billiards, the three remaining applications showcase what else besides playing billiards itself has been developed for mobile devices using their special features.

An interesting app, Billiard Rules, from Grenzstein.Apps has at its core an idea to provide users with the official billiards rules, but that is not all that this useful app does (Allmer 2013). The app has 11 customer ratings with an average of three and a half stars and it is free with advertisement, an option to remove advertisement costs \$0.99. The app was last updated in 2013. The app provides the user with all the official rules of billiards and a comprehensive list of rules for special games. These special games act as an interesting way to introduce players new games to try out. Additionally the user has the option to bookmark rules, rate and share rules with the community and to share rules via social networks or email. The interface of the application is easy to use with bottom tabs and clear categories. The latest update makes it possible to shake the phone for random rules and adds new rules to the game which promises for even more rules with following updates. This application would surely be useful for hobby players to find new games to play and for tournament players to have the official rules for settling disputes once they arrive.

Break Speed by Paul Nettle does what it says; it tells the user how fast he is breaking the balls on a pool table (Nettle 2013). The application costs \$4.99 and has 36 customer ratings with an average rating of four and a half star. The app was last updated 2013. The application records the users break speed by a form of audio recognition, displays it and enables the user to save his break speed and to share it via social networks. The price for the application is comparatively high, but it does correspond to the utility of the application. It is a nice way to impress one's friends or to study how to break faster.

Lastly to present is the MySnookerStats application by MySnookerStats.com. The application is free to use and has 47 customer ratings with an average of four stars (MySnookerStats.com 2012). The app was last updated 2012. The idea of the ap-

plication is that the user records the real time score including all potted balls of his on-going snooker game and after the game or a series of games the application analyses the user's game. The resulting statistics can be sent to the users account in MySnookerStats homepage where a basic membership is free and premium costs £10 a year. In this way the user of the application receives clear statistics of his game level and also has the possibility to track his progress and developing skills over a timeframe of years. It can be extremely useful application for a serious player, but perhaps not so for a casual one.

These five billiards applications present a colorful bunch of competitors in the field of mobile billiards applications. It has to be said that all of these applications have their markets and potential to succeed, but also that there is still room for more billiards applications with fresh ideas.

### **3.3 Methods**

The object of the thesis is to design a billiards application. To know what to design, the main features of the application will have to be described. Firstly the application will contain an image recognition algorithm in order for a picture of a billiards table to be transformed accurately to a mobile devices screen. Secondly the application will have a billiards simulator for a user to try out different shots with different spins on the current situation. Thirdly it will be made possible for the user to share their situations and/or solutions for other people using the same application. The other users will correspondingly be able to solve shared situations. Fourthly a user account will be created for personalized use. Fifthly it will be made possible to comment on any solution or situation and to rate the solution or situation between 1 to 5 stars. And finally a highscore table will be made that recognizes top billiards brains. Additional ideas to be implemented for the applications future releases can be found on Appendix 1.

The application design will be conducted in regarding to the rules of interface design, discussed in Chapter 2.3, with the purpose to include the main features listed above. Additionally literature which describes good practices in developing applications will be used. The method should be straightforward and focused on deliv-

ering a smooth and professional user interface. Important in the approach is to develop something unique; it has to be based on best practices on the inside, on the functional level, but on the outside it needs to provide something that stands out from the competition; the application has to be designed so that other developers cannot copy the idea easily and make it work and look better.

As far as usability is in question, it is crucial for the success of the application to find out how the included billiards simulator looks like and how the functionality fits to a small touchscreen. When needed to accurately aim a ball or move a ball on the table, a system that works fluidly is needed. For that, a study shall be done to all types of billiards games in order to find the best combination that works in a small mobile screen. Naturally on a bigger screen on a tablet like iPad, into which the application will also become portable, will the billiards simulator work more seamlessly because of more screen space available.

## 4 NEXTSHOT BILLIARDS

In this chapter the NextShot Billiards user interface is designed. The chapter is divided into the following six main design areas of the application: home screen, record function, solve function, billiards simulator and discussion function. Additionally the highscore functionality, settings and notification center presented together. All the design on this section are based on the screen size of Samsung Galaxy S3 and should appear in an A4 print in original size.

The structure of the application shows the whole functionality of the application, the places inside the application a user might end up and the connections between different places. The structure of NextShot Billiards can be seen in Figure 2 where each box represents a different screen.

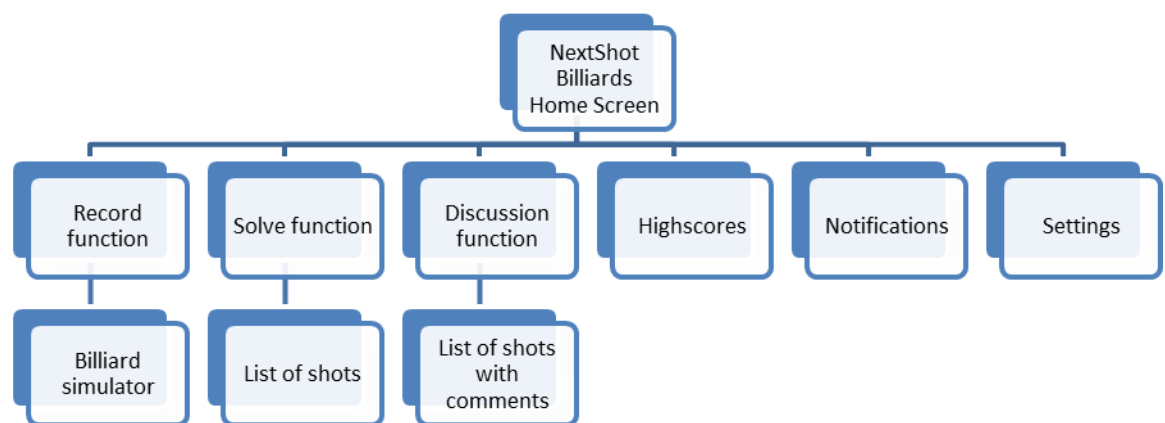


Figure 2. The main navigation and functions of the NextShot Billiards application.

The Figure 2 also functions as the basis structure for the application, meaning that the next phase is to create all these boxes, which is done in the following chapters.

### 4.1 Home screen

Everything starts with the home screen (Figure 3), the home screen is the main navigation of an application and it opens up once starting up the application and logging in. Creating a user profile and logging in is important in order to save users data and points to the system. Naturally it will also be possible to try out the application without logging in, in which case the home screen will be presenting a log in

button instead of player information. Without creating a user profile the user will not be able to post comments and solutions and he will also not be able to send his problems for the community to solve.

The home screen will consist of 4 main sections: the player information on the top of the screen, ad section below it, the main navigation buttons in the bottom middle position taking most place in order for easy usage with one hand and finally the notification center all the way in the bottom.



Figure 3. Home screen of the NextShot Billiards.

The home screen is designed only to be used on the vertical position and for that reason it will not turn horizontal when the phone is tilted. Images from Burke (2010), Mueller (2011), OCAL (2007, 2008), Sturm (2008) and Thackeray (Ref. 12 February 2013) have been used in creating the Figure 3.

#### 4.1.1 The player information and ad sections

The player information consists of user uploaded picture to represent the user on the left side of the section. This picture will be present on users submitted com-

ments, solutions, everywhere he is active on the application. User name, user rank and location are also presented. The User rank is a combination of points accumulated while solving billiards puzzles. The use of User rank is supposed to bring commitment and competition as well as communal feeling into the game. It is optional to show one's location on the application, but having the location can be interesting with a combination of private messaging. In that case people close by are able to send each other messages and maybe meet at a friendly billiards game at a close by billiards hall. Additionally pressing the player information takes the user to his or her profile page.

The last things that the player information shows are three columns for the achievements of a player. Firstly how many situations has been solved by him, secondly how many points has been given to him by other players, so called peer points, and thirdly it shows what rank a player has on the highscore list. The idea of these scores is to again emphasize commitment, but also importantly to give an incentive into solving other people's situations.

Some more explanation might be needed in regard to the peer points:

- When starting to use the application a player is given 2 peer points to gift to other people
- One peer point corresponds to 10 solution points on highscore list
- A player can give only one peer point to each single user
- For solving 10 solutions, a player gets 1 giftable peer point

The peer points are also on the other hand an honor system to give the community the chance to administer credit to extraordinary players.

The section of ads was added under the player info in order to generate positive cash flow for the application creators. On Figure 3 imaginary ads are used in order to avoid copyright concerns. These ad spots can always be changed and will be made available to sell to different advertisers. If there is need for more ads to be fitted into the assigned column, the section shall work as a carousel going around and bringing different ads. When clicking an ad, the phones browser will automatically redirect the user to the desired link on a separate window. Depending on the



contract with an advertiser the ads can have pay-per-click functionality, monthly advertising deal or a combination of both.

#### **4.1.2 Main navigation buttons, notification center, logo and status bar**

The main navigation buttons are solve, record, settings, highscore, and discuss buttons. These five buttons redirect the user to different subpages with corresponding functionality; solve starting the select a shot function, record the record a situation function, and so on.

The layout is made to emphasize the key features, solve and record, giving these features a larger icon to press on. On the design side are the navigational buttons on the bottom of the page in order for the user to reach them conveniently with their thumb while using the phone with one hand. The discuss button is the third most important feature and so has its place on the right bottom for using with the right thumb when holding the phone on the right hand since the majority of people are right handed (Holder 1997).

The notification center on the bottom of the home screen lights up when a message has been received on one of the user's commented threads or when someone has solved or commented one of the user's situations.

This feature will keep the user of the application up to date on what is happening on the community. Once the application is ready it is also possible to send all sorts of advertisement through this channel, such as weekly best solver competitions or links to local pool halls and local tournaments. In these days your smartphone knows where you are and so it makes it possible to invent more and more personalized notifications (Lawson 2012).

Lastly on top of the application is the NextShot Billiards logo and space for mobile operating system status bar. The NextShot Billiards logo is designed with Harlow Solid Italic font.

As in iOS, Android, Windows Phone or Meego operation systems, the notifications, time and for example the battery level are relevant to see for the user while

using any application. For that reason it has been chosen to let the status bar visible on most parts of the application. In addition it is a plus that similar status bars are used on all major mobile platforms on the top of the screen, as can be seen from trying out the various mobile operating systems, so that the placement does not pose any design changes when choosing the operating system for the application.

## 4.2 Record function

The record function is one of key features of the application. It can be accessed through the record icon on the home screen (Figure 3). When opening the record function the user will have on his screen only four guiding lines. The user is then expected to align the billiards table into these lines. Once the billiards table is aligned as seen in Figure 4, will the record function automatically record the situation; the circle on the middle of the screen will indicate how the record process is progressing. This process is not unlike seen in the Nokia Panorama application (cf. new imaging experiences 2012).



Figure 4. The record function of NextShot Billiards.

Once the situation has been recorded will the program recreate the situation into a three dimensional virtual format. In this phase the user will be taken into a new screen (Figure 5) from where he gets to see an eagle eye perspective of the layout of the balls on the table. Put other way: the situation in Figure 4 is transformed to a computerized format to Figure 5. From this screen the user has the option of sharing the situation, solving the situation, recording a new situation or returning to

home. The picture of the home button is a modification of an open source image (home icon black 2011). Additionally the screenshot of the billiards table, used with the permission from Celeris Inc., is from Virtual Pool 4 (2012).



Figure 5. Screen after taking a photo of a game situation.

### 4.3 Billiards simulator

The key component for the key functions of the application is the billiards simulator. The billiards simulator lets the user solve situations in a realistic three dimensional billiards table. The key for a functioning billiards simulator on a mobile platform is ease-of-use and flow. The billiards simulator can be accessed from the record function after recording a situation and from the solve function after choosing a situation to solve.

The interface of the billiards simulator as seen in Figure 6 is to be simplistic and uncluttered. The main image a user sees when launching the billiards simulator is the simulated billiards table with balls in the correct positions, the cue stick ready to hit the cue ball and the paths all the balls will be taking with the selected shot parameters, this all surrounded by a realistic billiards room. The billiards table is to be rotated, moved and zoomed with simple intuitional finger swipes. Pinching the screen with two fingers zoom's the picture in and out, moving the finger on the screen moves the picture and rotating two fingers in a circle rotates the picture. When the user aims the shot or changes speed of the cue ball or another parameter, the new path is shown on the screen without delay.

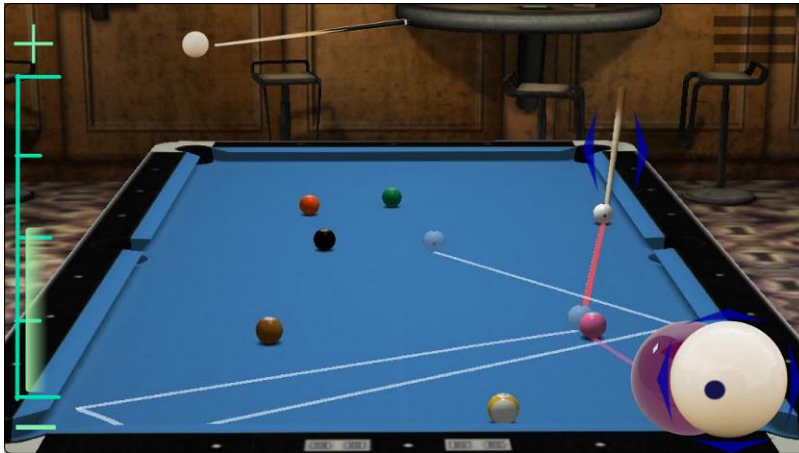


Figure 6. Basic interface of the billiards simulator. The billiards table on the background is a chosen screenshot from Virtual Pool 4 (2012).

On top of the main image of the billiards table and the billiards room are controls to try different shots. On the left side of the screen the user can adjust the speed of the shot using a simple slider control, or pressing the plus and minus signs on either end of the slider for fine tuning the speed. The bottom right hand corner of the screen is dedicated for displaying the cue ball and the contact the current aiming line would have on the object ball seen from an imaginary billiards player's vision. In addition the cue ball displays the selected point of contact the cue stick is hitting the cue ball, the spin of the cue ball. The spin is adjusted by moving the point with a finger and/or fine tuning the spin with pressing the blue arrows around the cue ball. Two last things to be seen are the elevation of the cue stick on the cue ball, which is adjusted with simple swipe and a menu for more options, such as for exiting the simulator, on the top right hand corner of the screen. The aiming of the shot is done by rotating the cue stick or pressing the arrows next to it for fine tuning the shot. The design of the interface should give the user a clear view of the billiards table and intuitive controls for the usage.

#### 4.4 Solve function

Solve function, the second key function together with the record function can be accessed by pressing the solve icon from the home screen. The idea of the solve function is to solve situations which a user himself and other users around the world have saved with the record function to the database of the program.

The solve function is divided into the first and second level layouts, the search and sort function and profile page.

#### 4.4.1 First level layout and search and sort function

When launching the solve function from the home screen the user is firstly confronted by a screen designed with tab navigation, more precisely top tabs as seen in Figure 7. The top tabs are similar to how a normal website navigation is done and in so familiar to users. Another alternative would be bottom tabs them being the more thumb friendly version. However, top tabs are chosen for familiarity and appearance. A similar top tab solution can be seen for example in foursquare and HitPost applications (see Appendix 2).

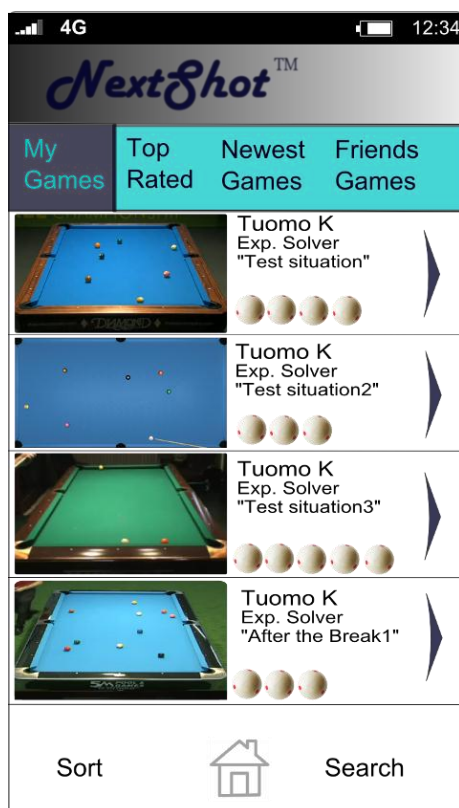


Figure 7. Solve function first level layout.

The first screen of the solve function has three functional layers and one static layer. The static layer contains the NextShot Billiards logo and the info slot of the mobile. The first functional layer from the top is the tab selection layer. It lets the

user select which category of situations the second functional layer shows. Available categories are:

- My Games                    showing situations that the user himself has taken or a person he follows has taken
- Top Rated                showing situations with most peer points
- Newest Games        showing most recent shared situations
- All Games                showing all situations

Important on the design of the tabs is to create clear contrast to know which tab is selected (Neil 2012, 17). In NextShot Billiards that is done with using reverse colors for the background and the text on the selected tab.

The second functional layer taking the most space on the screen displays the situations as selected from the first functional layer. From Figure 7 can be seen selected My Games tab and the results that follow from the selection. The situations are displayed in a list from top to bottom. A single item on the list includes a picture or a diagram of the situation, the user name of the submitter of the situation, the name of the situation, the user based rating of the situation and an arrow indicating a possibility for choosing the situation. The list can be moved vertically with a swipe of a finger to reveal more situations that do not fit on the screen.

The last functional layer is on the bottom of the screen. It is the bottom navigation that will remain through various sub menus with some alterations. The bottom navigation has two key slots that are static and one that changes regarding of needed functionality. The two static functions are the back button, which takes the user to the previous screen they viewed, and the home button which takes the user to the home screen. The third slot which changes regarding to needed functionality, will contain on this screen search and sort functionality.

The search and sort functions are sometimes taken for granted on a mobile platform but actually are full of small nuances to consider if to be designed correctly (Neil 2012, 81–82). Moreover is the value of these functions immerse, just consid-

ering the ease of using a dictionary in the internet as opposed to a printed one, or reading newspaper classified section as opposed to searching on eBay.

The search function launches by pressing the corresponding search button. When the button is pressed, the operating system specific keyboard will appear on the screen. The search will use the auto-complete feature as also seen in Google search: once the user starts writing on the search field he sees at the same time suggestions for search terms. By pressing a suggestion or by completing a search string and pressing the enter button, will the corresponding results be shown on the screen and the keyboard disappears.

The sort function works on a different style. When the sort button is pressed, on the screen will appear a list of different sort options. Once an option has been chosen, the sort list moves away and the situations of the current tab are sorted in as selected.

#### **4.4.2 Second level layout and profile page**

Once a shot has been selected from the first level screen in the solve function, the user will be taken to a new screen that details the selected situation. In this screen there are again a few different sections with specific functions as can be seen in Figure 8. First of all the logo and the information section are on the top of the screen, as in most other screens. On the bottom of the page is to be found the home and back button and additionally also a solve button. The solve button will let the user solve the selected situation, or in other words; it lets the user open the situation in a fully functional billiards simulator in order to try different solutions for the situation and ultimately to share his solution to other users of the application.

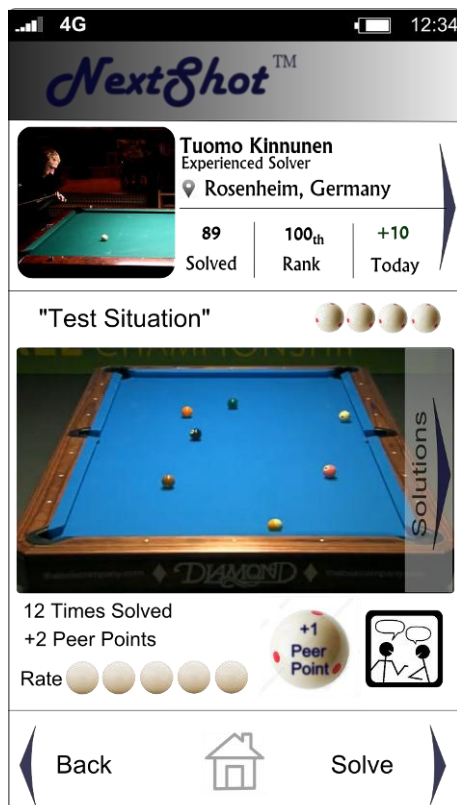


Figure 8. Solve function second level layout.

On this screen the user also sees the profile of the submitter of the situation. By clicking the profile he will be redirected to the profile page that includes more info of the user. An example profile page can be seen in Figure 9.

The last section to be described in this screen is the middle section. The middle section holds the most functionality. Coming from top down the user sees firstly the name of the situation, the situations current score and a magnified picture of the situation. By clicking solutions arrow on the picture, the user will be taken into a new screen with a list of all the solutions as seen in Appendix 3. Under the picture of the situation is info on how many times the situation has been solved and how many peer points the situation has received. There is also a possibility for a registered user to rate the situation between 1 to 5 cue balls by touching the white balls. From the button "+1 Peer Point" a user can contribute the submitter of a situation maximally one of his available peer points. From the discussion icon the user can open up the discussion section of that particular situation.



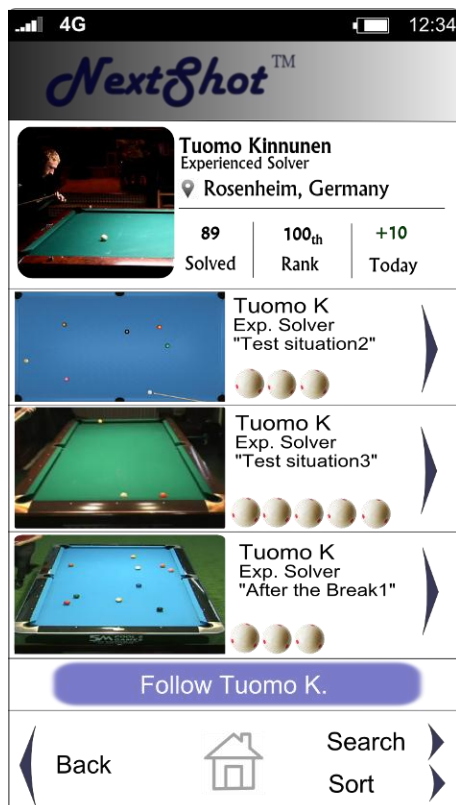


Figure 9. Profile page.

The profile page on Figure 9 can be accessed from the second level layouts of the solve function as well as of the discuss function. On this screen the user sees the profile of the submitter of the situation and all his other submitted situations and solutions plus his commented situations and solutions. By clicking the follow button the user has the option to start following the submitter, in which case the user will start receiving notifications when the followed person comments a situation or solution or posts a new solution or situation. The profile page also has sort and search function. As an example the user might want to sort the list to show only commented solutions by date descending.

#### 4.5 Discussion function

The discussion function can be accessed from the home screen and is designed to work in much the same way as the solve function. This similarity should make it comfortable for the user to use both the discussion and the solve function according to the guideline of striving for consistency (Schneiderman & Plaisant 2005, 74). The discussion function first level layout is almost identical to the solve function

first level layout (Figure 7). The only difference is that instead of the rating displayed, is the latest comment and number of comments displayed.

From the first level layout the user may switch between different tabs, use the sort and search functions and finally choose a situation to see the second level layout of the discussion function. The second level layout in Figure 10 includes as new functions add a comment button and an info button. Add a comment button enables the user to comment the visible comment stream. Pressing the info button the view changes to solve function second level layout, Figure 8, from where it is possible to return by pressing the back button. The resulting screen from pressing the solutions button is the same as coming from the solve function second level layout and can be seen on Appendix 3. After choosing a solution from the list the user is taken back to a similar screen as discussion function second level layout.

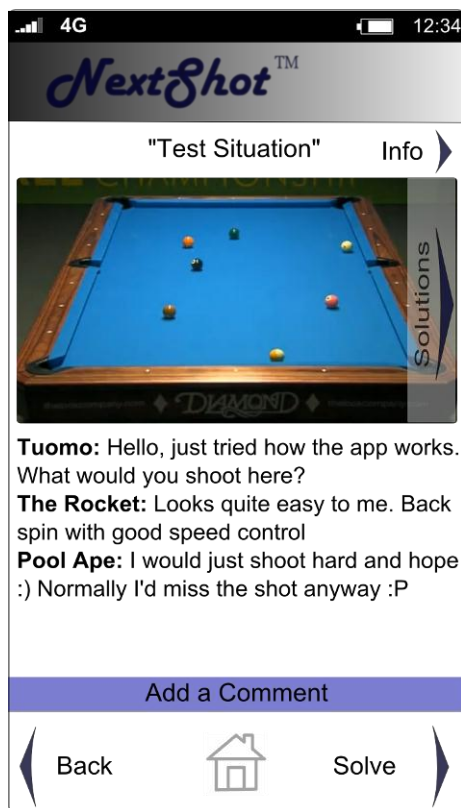


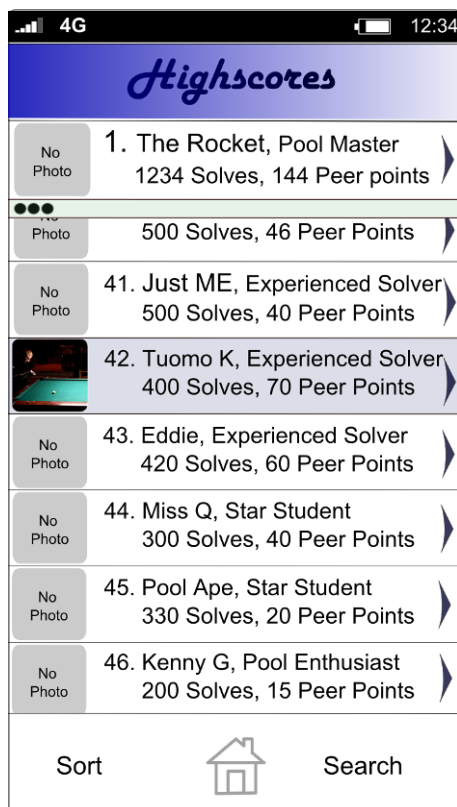
Figure 10. Discussion function second level layout.

The discussion function is the only means of communication to the users of the application, and so it is important that all situations and solutions are easy and quick to comment.

## 4.6 Highscore functionality, settings and notification center

On this last chapter of NextShot Billiards design the highscore functionality, settings and notification center are introduced.

The highscore functionality is accessed from the home screen and can be seen in Figure 11. The highscore table shows as a preset the combined ranking of solved situations and peer points calculated together, which can be changed by the sort button on the bottom of the screen to sort by solves only or peer points only. The layout shows always the highest ranked player on the top, and the personal ranking on the middle of the screen. With the search button a user can search for particular players rankings.




Highscores	
No Photo	1. The Rocket, Pool Master 1234 Solves, 144 Peer points
Photo	500 Solves, 46 Peer Points
No Photo	41. Just ME, Experienced Solver 500 Solves, 40 Peer Points
Photo	42. Tuomo K, Experienced Solver 400 Solves, 70 Peer Points
No Photo	43. Eddie, Experienced Solver 420 Solves, 60 Peer Points
No Photo	44. Miss Q, Star Student 300 Solves, 40 Peer Points
No Photo	45. Pool Ape, Star Student 330 Solves, 20 Peer Points
No Photo	46. Kenny G, Pool Enthusiast 200 Solves, 15 Peer Points
Sort  Search	

Figure 11. Highscore table.

The settings are also accessed from the home screen. The settings let the user set gameplay, user account and interface options. The settings menu is done with specific styles individual for iOS, Android and Windows Phone for integration with the operating systems. The gameplay section of the settings is for changing the outlook of the billiards table and the billiards room, for adjusting different aiming

aids and visual possibilities and for other settings on the billiards simulator such as touch sensitivity and controlling options. The user account settings let the user control settings such as user name and password, signing in and personal information. It also includes information of the player; how many hours he has played the application and how many solutions and comments he has posted. The interface options let the user change settings such as font size, color scheme, energy saving options for the interface and settings for notification center.

The notification center, entered through the home screen, shows a simplified list of notifications including new comments, situations, solutions, peer points and other notifications, for example increase of followers. From most notifications the user has the option by pressing the text to go to the corresponding situation, solution or user page.

## 5 RESULTS, CONCLUSIONS AND DISCUSSION

The thesis topic and task of designing a user interface to a social billiards application for mobile operating systems was created in the best way possible resulting to a completely unique and intuitive interface being born. When creating an interface it is important to always concentrate on the special requirements of the platform in question the application is designed for. For this the rules of mobile interface design were explained and thereafter used on designing the interface. In this chapter the results of the thesis are reported and examined. Also a discussion on the topic is presented.

### 5.1 Results and conclusions

The results to be evaluated are the designed main features of the billiards application: ability to transform a picture of a billiards table to a mobile device, an easy to use billiards simulator, possibility to share situations and solutions, possibility to solve other users situations, possibility to comment any solution or situation, possibility to rate solutions or situations, a user account and a highscore table. Firstly the results of the main features are presented and examined with corresponding conclusions. Conclusions of the application as a whole are presented afterwards.

The ability to transform a picture of a billiards table to a mobile device was designed as the recording function. On taking a picture of the situation many points had to be solved; it was important to find out a solution for using the camera of the mobile phone to create the most consistent photo angle to give maximum accuracy for converting the layout to a computerized format and the photo angle had to be possible for someone standing next to the table, not from the ceiling downwards as that would not be convenient, though easier to implement. For designing the screen after taking the photo there were many options for the layout but a simplistic approach was decided on with only three buttons and a home button. All in all the feature of transforming a picture of a billiards table to a mobile device was designed well.

The billiards simulator was designed to give the billiards table a prominent place on the screen with the controls for the shot being as unobtrusive as possible. This in turn led to a minimalistic approach on the design of the simulator. The design was made successfully but its usability will have to be properly tested before releasing the game, once its first playable version is made complete. There are areas in the layout of the billiards simulator that can only be properly designed by testing and adjusting. These areas are mostly the sizes of the touch zones on the screen for different functions. Overall, the design of the billiards simulator is corresponding well with the special requirements for designing to mobile interfaces.

The possibility to share situations and solutions was created successfully in the work. Sharing situations and solutions was designed integrated into the billiards simulator from where the user can share situations and solutions with two taps of the finger, the first tap bringing down the menu and the second sharing the situation or solution. For solving other users situations the solve function was created. Here had to be created a solution for firstly choosing a situation before solving it, for that top tabs and sort and search options were created. Finding a situation to solve was made easy starting from the home screen solve button, choosing a situation and from the chosen situation pressing solve; the billiards simulator opens and a solution is possible to draw out and share. The ability to comment situations and solutions was designed as a separate function accessed from the home screen as well as integrated in appropriate places on other functions. The ability to comment is a basic feature that has to be intuitively accessible. This was achieved in the design, on all places where a user would consider commenting, it is present and easy to do.

Possibility to rate solutions or situations, a user account and a highscore table were all designed into the application. Rating situations and solutions was added in most convenient location, on the screen for information on a shared solution or situation. User account was created as a profile page accessible from the home screen as well as from nearly everywhere where the users name is at. The highscore table was created accessible from the home screen. On the highscore table difficult was to balance the valuation of solve points and peer points, for this user feedback is needed for fine tuning in the future. Overall the main features of

the billiards application were all successfully designed and implemented in convenient, intuitive locations on the application.

The resulting billiards application separates from other current billiards applications for its advantage and has a unique idea behind it and in such has potential for being a success and generating positive revenues once finished. It is unique and designed with the best practices of interface design for easy, intuitive usage. As a next phase, the decision to develop the application through a third party or developing it independently by gathering a suitable team and financiers, has to be decided upon. Once the decision is made, the application will have to be made into code and tested thoroughly. Before releasing the application, the most important decision has to be made, which business models to use for creating revenues. The business model choice is the most critical point in getting the most revenue out of the designed application. For choosing the right business model, the additional ideas to be implemented for the applications future releases (Appendix 1) have to be kept in mind as well. The application as it is here designed would be in the utility stickiness model highly sticky with moderate to high utility; this in terms would lead to ad supported business model or virtual goods/subscriptions business models. The creation of a business plan will help make the best decisions regarding the future success of the application.

## **5.2 Discussion**

The aims of the study have been achieved remarkably well. Creating an application from a scratch is by no means an easy task and by completing this difficult task a lot has had to be learned along the way. Though the thesis work is a design of an application, a lot of theory has had to be written. Theory of the mobile interface design, research environment, competitor analysis and history of mobile application industry all have contributed to the wholeness of the work and provided important background to designing the best application possible. On the thesis process it would have had been better to have completed the theory sections before starting to design the application. Since the design of the application was al-

ready ongoing before the theory was finished, it was somewhat difficult to apply the learned intricacies from the theory afterwards on parts of the design.

On designing the application itself, for future works it would be better to make all initial design on paper by means of drawings, mind maps and comments and organizing it well. On this work most of the planning and designing was done only inside the computer which led to limitations and in some cases frustrations on working effectively. Understandably when a person has professional design equipment combined with multiple screens, and perhaps even a drawing pad, can the design be comfortable done only on computer as well. Otherwise on the design one has to have a clear direction into where the design is to be taken. When starting with the design of the billiards application, there were too many features and ideas to put in and the first thing after trial and error was to start removing excess features. Excess features are good to be left out as soon as possible for being able to pay more attention to the core features.

Suggestions for further study would be closer inspection of business models on the application industry and users attitude towards them. Also a study or guidelines of the process of designing and creating an application for mobile devices could turn out to be useful.

The ultimate goal is to keep working with this design of the billiards application and drawing a business plan for the commercialization of application.



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**APPENDICES**

## **APPENDIX 1 Additional ideas to be implemented for the applications future releases**

- The application will contain an algorithm that solves the next shot computationally for 9-ball billiards.
- There will be a possibility to ask a pro for a solution to a situation, for a price.
- There will be a free version to try out the application and the paid version
- More ideas to add for future releases:
- A golf type “swing” analyzing and improving for a price (see iSwing)
- Computer analyzing the difficulty of the shot (1-10)
- Computer analyzing the difficulty of the runout (1-10)
- Complete billiards game to play (or to play the whole current table + then also solution for a runout RunoutBilliards?)
- NextShot solution based on user preferences (do you rather shoot a hard shot or a soft shot, with more or less spin, backspin or topspin and so on to choose at user preferences. Also predefined “beginner” “advanced” “pro” or the normally used A to D player (with descriptions SOURCE)
- Adding NextShot for other billiards forms and games (snooker, karambole) and other table sizes (7,8,9 foot)

## APPENDIX 2 Foursquare and HitPost application top tabs

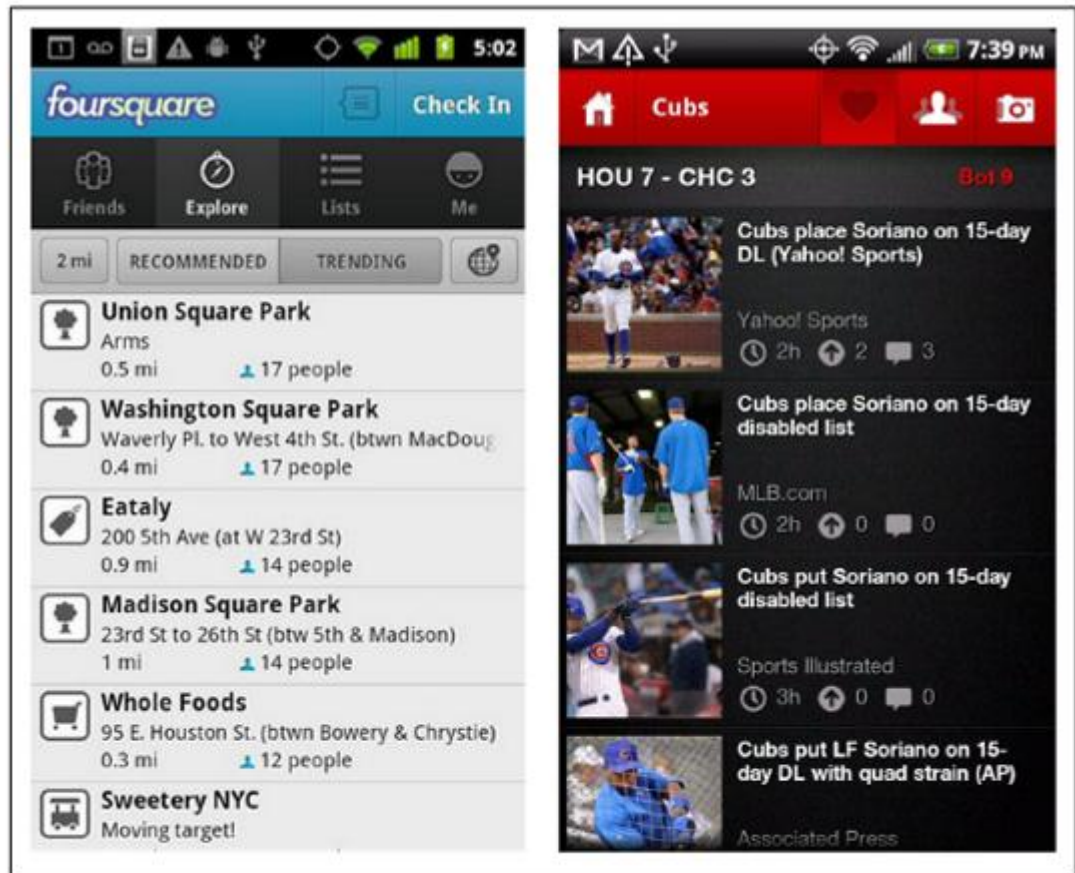


Figure 1-17. Foursquare and HitPost, top tabs

(Neil 2012, 17).

## APPENDIX 3 List of solutions and their comments

4G 12:34

**NextShot™**

"Test Situation" 

	<b>Pool Ape</b> 5 Comments "Hi Guys, just posting my solution, hope you like it"	
	<b>The Rocket</b> 1 Comments "You are the best Rocket! Thanks for fast Solution!"	
	<b>Miss Q</b> 100 Comments "Well, I think there is a big risk of losing the control of the 5..."	
	<b>Kenny G</b> 0 Comments	
	<b>Tuomo K.</b>	

 **Back**  **Solve** 