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MS IN HUMAN-COMPUTER INTERACTION
MOBILE INTERFACE FOR SPORTS WAGERING
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Mobile Interface for Sports Wagering

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Final Project Report

Master of Science Program in Human-Computer Interaction
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1. Executive Summary

According to Forbes, sports business growth in North America is expected to exceed $100B by 2020. MAX identified that fans are an essential component of the sports industry and

proposed this project to conduct research to understand better the Fan Experience (FanX) in sports and then design an innovative prototype solution.

Through analysis, user's had demonstrated that the need for fan engagement was an issue in which many people are less likely to attend a game in person. Through research, our team engaged with users both on and off court to develop information that may drive our design direction. Initially a literature review and competitive analysis was conducted to understand major components of the problem space. A competitive analysis was also completed to understand the commercial products currently available in the market. These insights shaped the field researched approach and were essential in later design and ideation phases.

Field Research (rapid) was conducted both at sports stadiums and other venues where fans gather to watch. This work identified a range of pain points and user needs that aided in the development of two distinct User personas. This work was also carried forward to inform ideation. An ideation process was developed to generate innovative solutions to solve the priority problems identified. Ideations began with a series of divergent thinking exercises to generate as many ideas and sketches as possible. Then transitioned to convergent thinking, where concepts were integrated and iterated upon to settle on a final concept design.

The final design concept was then presented to MAX for review and feedback where some new concepts emerged. MAX will now host two sessions for the exploration and evaluation of FanX prototypes. One at a non-stadium game watching venue and one at a stadium. During these sessions low fidelity prototypes concepts will be produced and explored and current MAX high fidelity prototypes will be tested. This will aid in the decision process for the conceptual design that will be taken forward for additional prototyping and testing next semester.

2. Introduction

MAX is a company based in Carmel, Indiana that specializes in rapid prototyping of hardware and software solutions including mobile applications. MAX identified that fans are an essential component of the sports industry and proposed the current project to conduct user research and create a prototype of a mobile application to increase the engagement of fans watching sporting events. One goal for MAX is to connect the user experience of sporting events with sponsor brands in innovative ways.

3. Business Objectives

The project partner MAX provides outsourced, technology-oriented, research and development services. They accelerate product development for clients and specialize in rapid prototyping of hardware and software products. As well as providing these outsourced services, MAX also

identifies business problems with commercial potential and then designs and builds prototypes that can eventually be refined and taken to market.

The proliferation of smartphone use by fans during live sporting events was identified as a problem space ripe for innovation. The need to keep fans engaged at sports events is seen as a critical aspect of sports business for teams and owners. The ability to connect directly with fans via their mobile phones would be an attractive opportunity for sponsors and permit a revenue generation model where products could be developed and provided to fans at no charge. To capitalize on this opportunity, MAX plans to launch a sports-focused product line under the brand XFAN.

MAX retained this project team to help understand sports fan dynamics and iteratively design and test prototypes that can be utilized as part of XFAN. The level of team diversity and knowledge of sports and current fan technologies in the market should enable innovative solutions to emerge. The intent is for the solution developed to have the potential to be brought forward as a viable product that XFAN can offer to fans and sponsors.

4. Background Research

Literature Review

Conducting a literature review helped us understand the different approaches that previous research and studies have found to increase sport attendance and fan engagement in sports games environment. We also learned about existing applications that support fan engagement, as well as sponsorships and funds in a sports environment.

The academic literature on the fan engagement aspects of sports is vast. At every stage of the project, updated literature reviews were conducted to support the agile design and build process that was adopted. Below is a summary of the seminal articles discovered throughout the project. A complete listing of all articles and journalistic articles reviewed is included in the references section of this report.

Initial reviews explored all aspects of engaging fans both in-venue and remotely. From tickets to social media and interactions with teams and players there was a clear data-centric approach connected with innovation. A central theme being data derived from competitive team play driving social engagement for fans and the brands that sponsor sporting events. The large crowds attending sporting events and the associated logistical challenges (food, parking etc) were problems consistently addressed in the literature. [1-4]

An important article to review for this project as it explores the fantasy sports fan compared to the traditional sports fan. The XFAN triple play application has aspects of fantasy play where the fan is selecting players to follow in the game and cheer for as opposed to a singular team. The heightened levels of enjoyment validate the potential of XFAN for users to enhance the enjoyment of the game. [5] Since the XFAN project is looking to attract a broad base of user

types its important for the team to understand the demographic differences of Fantasy Sports users. This article provides great insights into these motivations during the life cycle of a sports fan. [6]

Tacon, Richard and Vainker, Stephen (2017) Fantasy sport: a systematic review and new research directions. *European Sport Management Quarterly* 17 (5), pp. 558-589. ISSN 1618-4742.

This is an important resource that evaluates the literature around fantasy sports fairly broadly. WIth over 71 articles there is a lot of material to review, but it does provide good baseline knowledge of where our scientific understanding of the social aspects of fantasy sports is today and where there are still gaps going forward.

Fink, J. S., Trail, G. T., & Anderson, D. F. (2002). Environmental factors associated with spectator attendance and sport consumption behavior: Gender and team differences. *Sport Marketing Quarterly*, *11*(1).

A really good look at the gender differences of spectators at basketball events (primary pilot site for XFAN) that focuses on 3 key areas. 1. Environmental Factors 2. Present Behavior 3. Future Behavior. There are some great insights here that can be applied to the project.

Casper, J. M., Pfahl, M. E., & McCullough, B. (2014). Intercollegiate sport and the environment: Examining fan engagement based on athletics department sustainability efforts. *Journal of Issues in Intercollegiate Athletics*, *7*, 65-91.

This article focuses on sustainability efforts and sports. This is an appealing area to the youth demographic right now. How might these be connected to the XFAN sports app. Green strategies are becoming more relevant in gaming situations, and span across multiple organizations, athletic departments, and local organizations. As a collegiate level organization, it is important to embrace the education of sustainable awareness for ‘green gaming’. Through the analysis of the survey conducted, the researchers are able to understand fan engagement and more importantly their belief systems when it comes to the environment.

Weiner, J., & Dwyer, B. (2017). A new player in the game: Examining differences in motives and consumption between traditional, hybrid, and daily fantasy sport users. *Sport Marketing Quarterly*, *26*(3).

Wells-O'Rear, W. (2018). *Social Media Sport Engagement: Examining the Influence of Product Post, Purchasing and Generated Revenue* (Doctoral dissertation, Northcentral University).

This work takes a comprehensive look at the role of social media platforms in Sports Business. Since many of the application concepts we may end up developing have a social component, indeed its central to the success of the application, this is an excellent resource for continued review.

Review - 5

This article discussed how sports clubs and organizations in **Europe** are approaching their fan to increase fan engagement. The articles suggested treating sports fans as "valuable guest" of your brand who are emotionally connected to the sport, club, and the team, instead of customer or consumers. It highlights the significance of gathering data,(before even knowing what to do with it, similar to a team of Olympic Gold medalists Laura Trott and Jason Kenny) to better understand the fans, or supporters' preferences and behaviors to connect with them. The articles provided a matrix produced by David Fowler and Geoff Wilson that is used to manage fan engagement on and off-site and on match days and non match days. The article also emphasized collecting data as the major step, followed by understanding and using that data. They provided examples of what current clubs are doing for fan engagement on and off the field, and non match days and non match days. A few of the example include:

1. The Open (golf): Ordering food from your seat (using mobile devices)
2. Minnesota Vikings (NFL): VR sports museum (Old Museum upgraded to interactive and virtual reality (VR) elements that allow fans to virtually compare themselves with their heroes/sports players)
3. Real Madrid (football): Fan app (fans can purchase merchandise, check stats of the sport, or explore deals tailored to the user.)
4. Benfica (football): Emirates “safety video” (on match day, sponsors team with clubs to show safety instruction, where many fans are engaged and capturing/sharing the moment on social media)
5. Tampa Bay Lightning (hockey): “Smart jersey” (the hockey club/team embedded RFID chip to the season ticket holders' jerseys, where they receive a discount in the club store and the retail stands if they wear the jersey.
6. Atlanta Braves (baseball): Creating memories (fans can take selfies with their players and share it)
7. Manchester City (football): High-speed wireless internet (the Etihad stadium provide fans with high-speed wireless internet access so that fans can share their experience at the game on social media
8. Tour de France (cycling): Data predictions (using GPS and radio frequency chips attached to each bike, fans who're watching the race on TV can see all aspects of the race.
9. Notre Dame (college basketball): Emotional content (sharing emotional content)
10. AS Roma (football): Fan-designed website (taking suggestions from fan and catering their need)
11. ECB (cricket): Fan app (allow fans to replay previous games

Reference: https://other.media/best-in-class-sports-fan-engagement/

Review - 6

Sponsorship sports events and professional sports(Garcia, Puig & Lagardera, 2005) are taking a specific amount of funds. Sports federations, professional, college and amateur clubs, and teams ask for economic support so as to spread the fans attendance which will increase the sports attendance. This step was taken because there was a decrease in participation in sport. Specific competitive sports such as baseball, soccer, basketball, and rugby was taken for study. Here they have studied the forty different sports and recreational activities as the Council of Europe. The selection of various independent variables was based on previous findings from the research. Income levels and occupation and professional status are drawn from economic theories; while individual and social characteristics–gender, age, educational levels, type of household, or degree of urbanization – are taken from sociological

theories and sports motivation from psychological theories.

They have studied the total population of 365000 aged between 16 and 65 years, classified under the gender, age, and size of a population. This survey was conducted in the latter half of the 2004 and the method used for the same was the network telephone interviewing system(CATI). So as to study the demand of the sports attendance that used the profit model. There was another interesting finding in that paper was that there is no relation between the frequency of sports participation and sports attendance. The participation of women is more than that of men. The main positive determinants of the frequency of sports attendance are the size of household, consumption of sports practice and competition motivation, while it is negatively determined by age, the degree of urbanization and recreational motivation. In the case of the men participation, the role played by the occupation and professional status is practically irrelevant.

Here there is a clear distinction between the sports participation decisions and the sports attendance decision. This might be helpful to sports managers, sporting organizations and government so that they can select effective strategies to increase sports participation. There are two separate things like sports participation and focusing on sports attendance. Also, so as to attract more people to sporting events communication strategies should be focused on competitive and fans motivations. Finally, it should be interesting to promote sports attendance through sponsoring community activities, such as school activities and club activities.

Competitive Analysis

We conducted a competitive analysis to help us assess the strength and weakness of the current and potential competitors. Our goal for the competitive analysis was also to explore insights on the type of existing services and features that our target audiences might like; Also, to possibly help us discover new services and features that can bring engagement and excitement to sport fans/spectators. The study gives us both pros and cons in order to identify the opportunities and threats, which is an essential factor in corporate world.

We focused our analysis on FanDuel and DraftKings. Our lists of pros and cons for each of these applications are presented in the table below.

FanDuel	
Pros	**Cons**
• Uniqueness of ability to choose teams • Incentive based utilizing a ‘gambling’ like system without oversight from the State. • No government oversight • High risk with High reward • Partnerships with NBA, NFL and MLB	• Have become so large they are dealing with PR issues • Many politicians are against the App • Considered gambling in many communities • Can lead to unhealthy habits of spending • Underage gambling?

• Integrated in the system with influence through advertisements • Job growth • Investment in the community and in the overall system through ads and partnerships • Research based selection process of players on a team, not a game of 'luck' • 5.5 Mil users combined with Draftkings • Partnered with Google Capital and KKR • Development of new product, acquiring new customers and investment in management • 100% bonus for first deposit up to $200 • Provides a lower rank for high stakes games • Can handle a large volume of players • Salary Cap leagues, or weelong leagues • FanDuel Players Club (incentive to earn more points) • Will reimburse your money as credit if you do not finish first on first competition • Simple to enter the sport, with clear roster setup • Lock-in roster allows for one to see the ownership percentage of players immediately • Ability to view other opponents lineups before beginning gameplay • Operational in US, Canada and UK. Plans to add to Germany and Malta	• Accessibility to youth without proper education • Unable to withdraw bonus money immediately • Experienced players still prefer a desktop version ○ What can be done to empower more phone usage for ingame settings?

Draft Kings	
PROs	**CONs**
• Ability to earn money without being considered gambling	• PR Issues • Underage accessibility

• Incentive based with high earning prizes
• No government oversight
• Partnerships with most large Professional sports teams in the US
• Combined with FanDuel has 5.5 million users
• 416 million in investment funding
• Fox Sports has 11% stake
• Allows for the ability to double first deposit up to $600
• Offers eSports, MMA, PGA, and NASCAR
• NFL
  ○ Higher salary cap for weeklong leagues at 10k more than FanDuel
  ■ Can play a Flex Player
  ■ Player pricing based on algorithm of match up, weather, location, past performance, value compared to other players, player popularity
• VIP program; those with high gameplay volume gain unique opportunities for contests and exclusive live footage
• Beginner Friendly
  ○ Beginner games for novice; with opportunity to still play real money
• Late Swap players
  ○ Important for NBA last minute notices
• Satellite Contests	

Competitive analysis sources

- https://docs.google.com/presentation/d/1YA0K9bCan2f8H58bEASSPDqp5IJFlDw98CfFsExpL_Y/edit?usp=sharing
- https://theblackandwhite.net/48028/opinion/debating-the-legality-of-fanduel-and-draftkings/
- https://playinglegal.com/draftkings-or-fanduel

- https://phinphanatic.com/2015/10/07/the-long-con-of-daily-fantasy-sports/
- https://www.onlinegambling.com/fantasy-sports/dfs-vs/

5. Field Research

Observation and Interviews: In Arena

In order to understand better the professional basketball game environment and spectators, we conducted a field study at Indiana Pacers games at Bankers Life Fieldhouse. For the games we attended, we observed fan activities and interactions while the game was in progress, as well as before and after the game and during breaks in the game.

Methods

Direct Observation:

Activities:
In game observation - Stadium
Interaction with fans
Understanding of game through screens

Informal Interview: Passive observation was followed up by informal interview with the user to understand their experience throughout the game. Questions were derived from notes taken during game and general experience.

At **Pacers vs Trail Blazers** game on Oct 29, 2018. We observe what fans are doing during the game and in-between (break times or half times) the games. We noted down everything including the activities that they performed during and between the games, as well as their reactions. We take note of any distractions or any factors that might caused them to lose attention and disengaged them from the game. We also observe whether they used their phone or not and if they do, what do they use it for and when they are using it.

Results

From the data that we gather from the field observation, we were able to discover many insights such as identifying some of the users' pain points, as well as their needs. We were able to discover some of the reasons why fans were engaged and reasons why they were not engaged.

Reason fans were engaged

- Key Events in the game trigger crowd engagement (especially when their team is winning, etc)
- When they are able to participate in trivia games in between games or during time-out
- Intense moments such as when game score are constantly changing and making it hard to predict which team will win
- When they can share the game experience on social media (Ex: Sharing game highlight on snapchat)

Reason fans were not engaged in the game

- They get distracted by their phone (incoming text, games, taking selfies,etc)
- Engaging with other sport while they are at the game (fantasy sport games, etc)
- Their seat is too far from the court and also the screen (depending on where they sat in the stadium, fans experience can vary)

Observation notes and captioned photos from our research at Pacers games are presented in Appendix A.

Result Analysis

Based on the field research, we developed two personas. The personas represent some of the fans that we observed during Pacers games.

6. Analysis of Users and Activities

Based on the Field Study (Field Research & observation), we developed a couple of user personas that represent the people that we observed during the field study to help us guide our research and design focus.

Persona #1 - THOMAS

In-stadium game experience with family

"I'm a huge sport fan so i enjoy watching sport games with my family. But my wife and my daughter are always distracted by their phone. I want them to enjoy and engage in the game.

Age: 49
Work: Office Manager
Family: Married, 2 kids
Location: Indianapolis, Indiana
Character: Competitive

Goals

- Be able to find a cheap parking space near the stadium and arrive on time for a game
- Find a coupon that he can use for food and beverages
- He wants him and his family to enjoy the game without any distraction (phones, etc.).

Frustrations

- Finding parking is difficult and expensive
- Food at the stadium are so expensive
- His wife and daughter are always on their phone and not paying attention to the game

Bio

Thomas is working as a manager at a small business firm. Since the company has only one manager, he hasn't had a day off for several weeks. The company recently hired an assistant manager so he's finally able to take a day off. Since there is a Pacer game on Monday night, which him and his son love, he decided to spend his day off with his family watching Pacer game and also use it as a family get together. He is frustrated because finding parking space near the stadium is difficult and the food at the game can be pricey. He's also frustrated that his wife and daughter are always getting on their phone (taking pictures, games, and social media). He would like them to enjoy the game but he doesn't know what to do.

Persona #2 - Jeremy

In-stadium game experience with friends

"I am not a sport fan but I'm here to just give company to my project partners. My main aim is to just relax so that I can get back to my assignments with fresh mind set."

Age: 21
Work: College student working part time at school
Family: Single
Location: Indiana
Character: Studious

Goals

- Understand the game more and how it played
- Start with a fresh mind so that he can perform well in project and finals
- Learn about the players and the team

Frustrations

- The game moves really fast and its hard to keep up.
- The terms his friends are using he is not aware of that

Bio

Jeremy is a graduate student and working with one of the university professors. He is someone who likes to spend time in the library rather than watching or playing sports games. He is frustrated because as the school semester is coming to an end there are more projects and test so he needs some break to start with the fresh mind. One of his project partners who is an avid sports fan invites him to the Pacers game. Since he has never watched the single game in stadium Jeremy is excited to watch one and enjoy as much as he can.

Activity Model

Experience Journey Map

Study summary: We created an Experience journey Map to help us understand the user experience of going to a sport game in Arena setting (as well as off-arena). The personas that we created previously helped us to identify the goals, needs, and frustrations of sport fans.

To visualize the notes taken during the field observations we used User Experience Map. We established different stages of the experience (complete task of going to stadium, watching the game, activities perform during and in-between (or half time) games and coming back). The next step was to map the user emotions and activities to the established the different steps/stages that users go through. The stages being from the plan phase where the decision is made to watch a basketball game live with family and friends followed by purchasing the tickets. During the game day, starting from parking, pregame, all the quarters and the breaks in between are covered under the mapping.

A graph is plotted indicating the nature and magnitude of emotion experienced by the person across all the stages mentioned. The depressions and its magnitude in this graph gave us an understanding where the users are having poor experience. From this we deduced the pain points in context of stadium experience.

User pain points In-Stadium Experience

- Late on capturing a picture or 'snap' when an exciting play takes place
- Inability to participate in prizes unless their seat is chosen, however wish they could engage in the trivia.
- Trouble finding multiple seat's together, unless ordered together
- Difficulty in finding a parking space
- Don't want to miss any part of the game, but are hungry/thirsty
- Worry about traffic getting back home in a reasonable time, may leave early if game isn't going their 'team's' way

We derived the user needs from their pain points to be addressed with help of affinity diagram.
(Refer to Appendix: C for Affinity Diagram)

User Needs

- Easy and quick way of finding and buy multiple seats together.
- Nearby parking alternatives.
- Get navigation information for available parking spots, seats, food & drinks .
- Avoid traffic congestion during exit.
- Shots of iconic moments in the game.
- Simple and fluid way of participating in breaktime contest while not discouraged by chances.

Application functionalities/goals

The following application functionalities/goals were derived from our field research, literature review, competitive analysis, and the business objectives/goals.

Wager system to engage users into understanding players & game

- Place wagers based on hot or cold players of the week.
- Engage with friends in a betting system
- Engage with other individuals outside of one's social community.

Allowing all users to collaboratively engage in stadium 'gaming'/'trivia' experiences.

Throughout the game, one can notice many fans engaged in the trivia and prize contests that are happening throughout the stands and on the court. Many users demonstrated an excitement which provides for an opportunity to get engaged through application. With many user's continuing to hold their phones in their hands, yet engaged in the contest, there is space to develop a full on contest experience for all fan's leaving no one out.

Providing real-time data of player's in order to place wage's for each quarter.

Many users are constantly using their phones to engage in fanduel or draftkings, in which there is an opportunity to place wages and earn big. The ability to have coins and other gamification techniques incorporated in the app will provide for a fun experience for both kids and adults, even if a big wage is not placed. The ability to have food and drink sponsorships will allow for incentive to engage in a family friendly app.

Provide content with ratings of player's performance for expert analysis and conversation regarding a game.

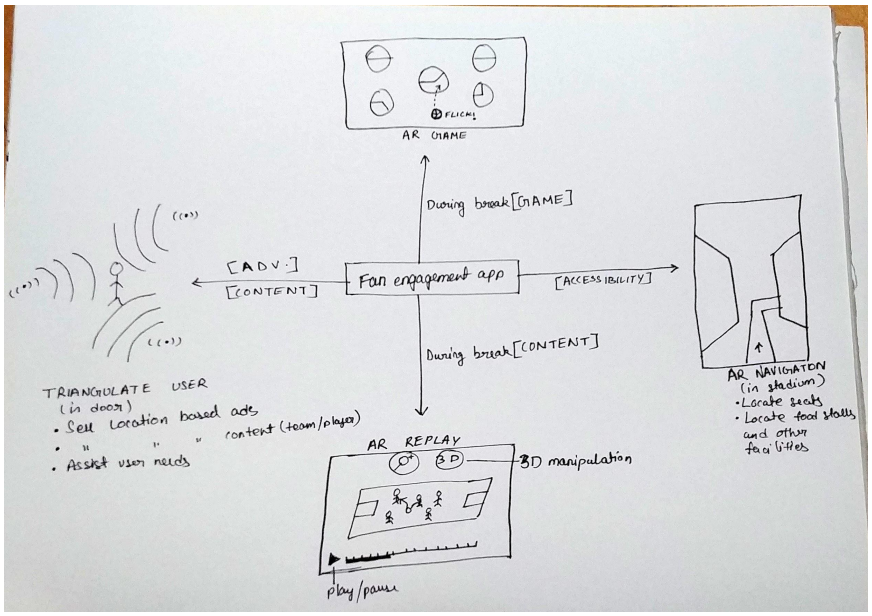
Through engagement with fans both in stadium and in sports bar or home, users tend to discuss and have friendly arguments regarding the quality, skill level, or status of a player. Many tend to utilize google, espn, sportscenter, or other applications to seek data regarding a player to help their argument. This is a key area that can provide for further features in the application, to provide for real-time accurate data with feedback from credible sources on the team.

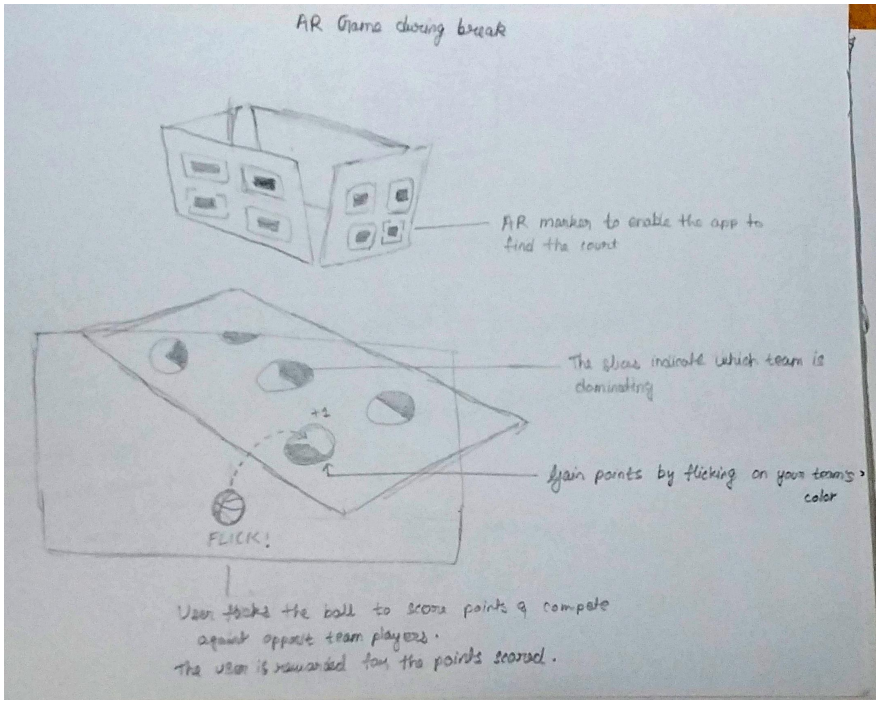
7. Conceptual Design

The next step was to brainstorm design ideas to achieve the defined goals.

Design Concept 1: Fan engagement during downtime

This design concept allows users to replay game highlights in AR (Augmented Reality) view where they can view the replay from different perspectives. It also allow users to use an AR navigation that helps them locate their specific seats, as well as finding food stalls and restrooms.





Key elements:

- Gamification using AR to compete as teams at the stadium during the breaks.
- Geolocation beacons to push contextual content to the user.
- AR in-stadium navigation.
- AR replay/highlights where the user can pause the replay and manipulate the content in 3D.

This solution addresses multiple user needs and satisfies goals defined during research. The augmented reality game is aimed at controlling the use of mobile phone by gamifying the break duration using an AR game to compete with opposite team fans ins stadium. This promotes user engagement during downtimes while building brand loyalty through rewards from sponsors. This benefits both the user and the sponsor.

The augmented reality replay enabled with 3d manipulation for the user to see a different perspective of the action. The screenshots from this are quick bite-sized content easy to share and consume.

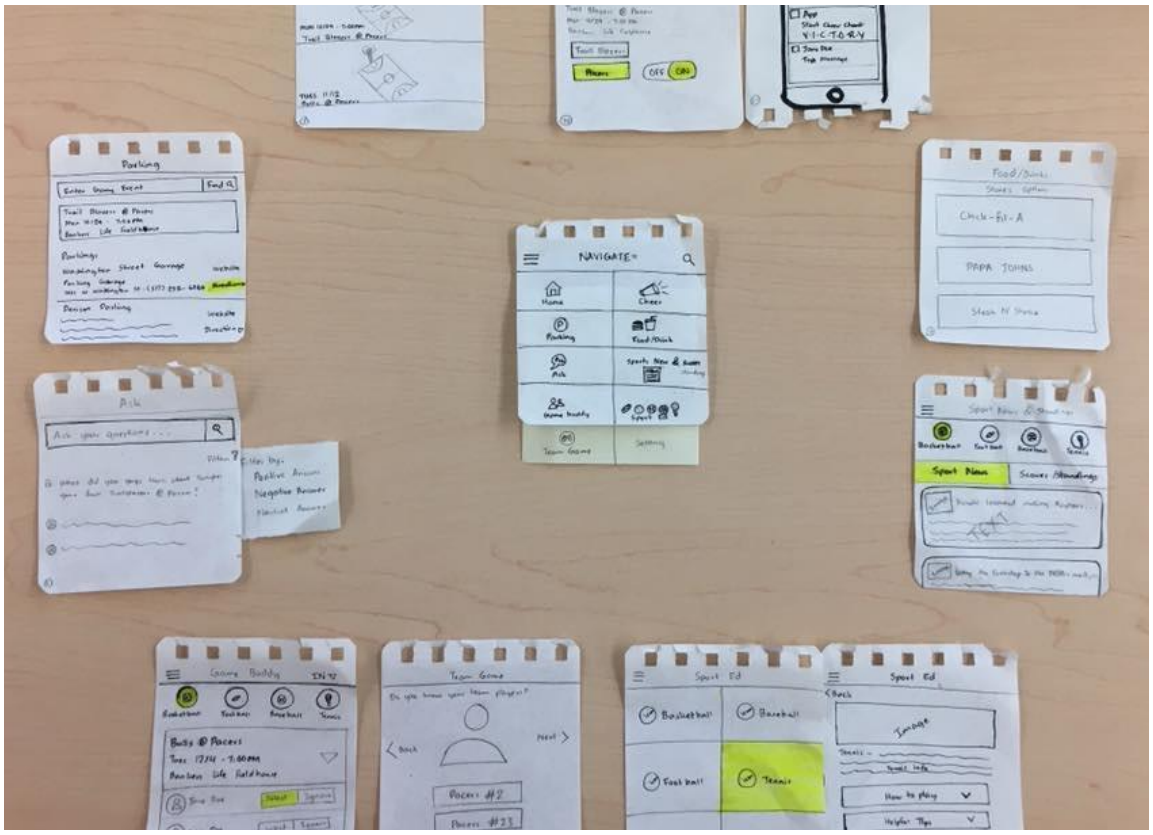
The geolocation of user with multiple beacons across the stadium helps in providing contextual information and advertisement to the user. This also enables us to help the user's better.

The navigation enabled by augmented reality solves the user's problem of finding the right seat, food stall, and other stadium facilities.

Design Concept 2: Overall stadium visiting experience

This design concept/sketches illustrate the overall experience of the sport user/fan. The main purpose of the concept is to enhance the overall experience of the user including:

- locating parking near the arena,
- ordering food from their seat,
- getting a reminder (cheer chant/tactics to use) for cheering
- asking sport related questions from the ask feature,
- Finding sport buddy who can go to the game with you
- The last feature allow users to learn more about different sports



Key Elements

- Convenient Parking Finder for any sports games using a mobile app
- Ordering food/drinks through the mobile app from the concession stand
- Any sports-related news and team standings in any sports
- Communication platform for sports fans (Q & A)
- Find a Game buddy (other fans) to watch a live game together
- Learning about other sports
- Team game or trivia questions/games that test the fans knowledge of their supported team

Design Concept 2 support users needs by goals from the field research/observation that was conducted in stadium, bar, and home. The cheer feature help fans engage in the game by getting a reminder when to cheer and what cheer chant/tactics to use. The food/drink ordering feature also allows fans to order food/drinks from their seat without having to wait in line at concession stands, as well as keeping them from distractions (ex: leaving the game to buy food).

Convenient parking finder feature allows users to find parking near the stadium which saves them time and prevents frustrations caused by parking garage/space availability.

The game buddy feature support users need in finding fans who are also looking for other fans to go to the game together when they don't have anyone to go with.

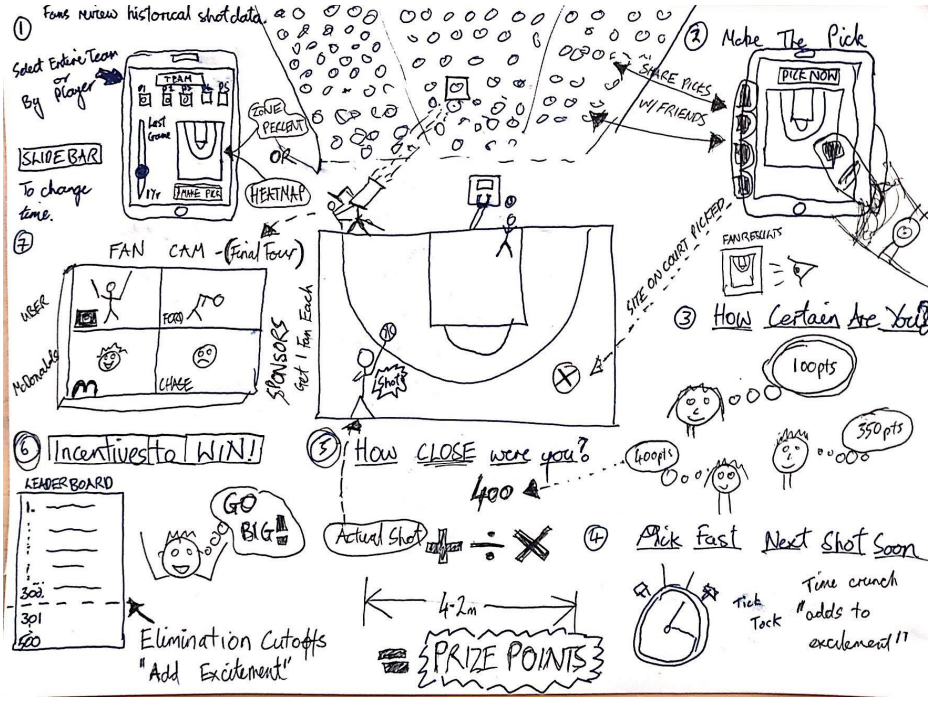
The Ask or Q & A feature help the sports fans to keep each other updated and to keep in touch by asking each other's opinions about the game that they watch or any other sport-related questions.

The Sports News & Standings feature allows fans to keep updated about sport related news and their team standings. The Sports Ed feature enabled fans to learn about other sports that they’re curious about by providing them short info, how to play, tips, and practice game to get a feel of what the sport is.

The Team Game feature allows fans to get to know their team players better by playing trivia questions/games that test and enhance the fans knowledge of their supported team.

Design Concept 3: Live action fan engagement

The main purpose of this design concept is to keep sport spectators to engaged during live basketball game. Some of the feature included shot prediction. This feature will allow the user to be able to predict the next shot that the player will make from specific spot on the court from the previous games data, which will be available in application. They can wager the in-app currency and if their prediction is right they can get twice as much as they wager initially.



The main purpose of this design concept is to keep sport spectators to engaged during live basketball.

Key Design Elements:

- Provide an engaging interface for review historical basketball shot data
    - Connects fans with players and teams
    - Timebar feature allows a dynamic view of shot patterns over time
    - Improves Fans ability to predict where the next shot will come from
- Shot prediction interface allows Fans a fast way to make a prediction
    - This enhances fan engagement throughout the entire game
    - Even casual fans are able to make a simple guess
- Selecting the number of points to stake on your selection improves fan excitement levels
- The calculation of how close your guess is with the actual shot to generate Prize Points will enhance the excitement.
- Further incentives to risk points each round are generated through an elimination cutoff system. The lowest scoring players are eliminated from the competition.
- The use of a Fan Cam ensures losing players can still follow along and stay engaged with the system and sponsors have an opportunity to expose their brands in novel and fun ways.

Our research revealed a number of key aspects of fan engagement during live professional basketball games. This concept was developed to address some of these aspects and improve the overall experience of fans in a stadium. Excitement levels of sports crowds are driven by a range of factors but a core element in every game is scoring events. In basketball, scoring events are very frequent and a variety of statistical data is captured and shared in real time. This data includes parameters such as the player making the shot, the time the shot was taken and the coordinates on the court where the shot was taken from. Historical data is available where the shot is taken from and can be combined to provide rich visualizations in the form of

zone statistics or heat maps. When this data is presented to fans they can quickly understand shot trends and make predictions

By giving fans a method to stake points on each prediction a competitive dynamic is added to the shot predictions they make. Many games in the NBA have uneven score lines where one team dominates points scored. In these situations, fan excitement levels are much lower and many will actually leave early. This concept combats that negative experience for fans by giving them a way to remain engaged in the action on the court even if their team isn't winning.

Ideation Selection Process

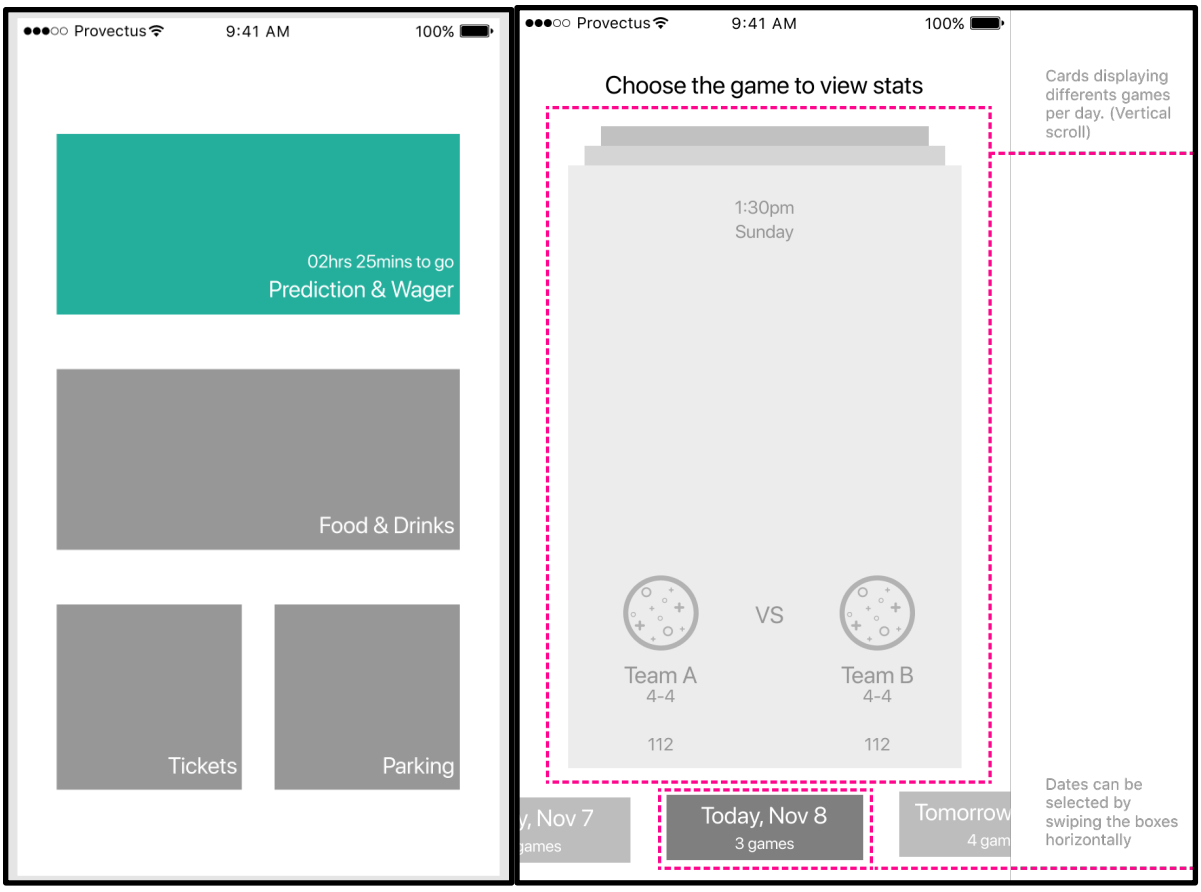
During the design ideation phase of this project, new ideas were continually generated, explored by the team and iterated upon. Naturally, there were many features that morphed into new concepts or merged with existing concepts.

The Live Action Fan Design (Design Concept 3) was selected because it offered the most flexibility to integrate the best design elements from the other concepts.

8. Low-Fidelity Prototype

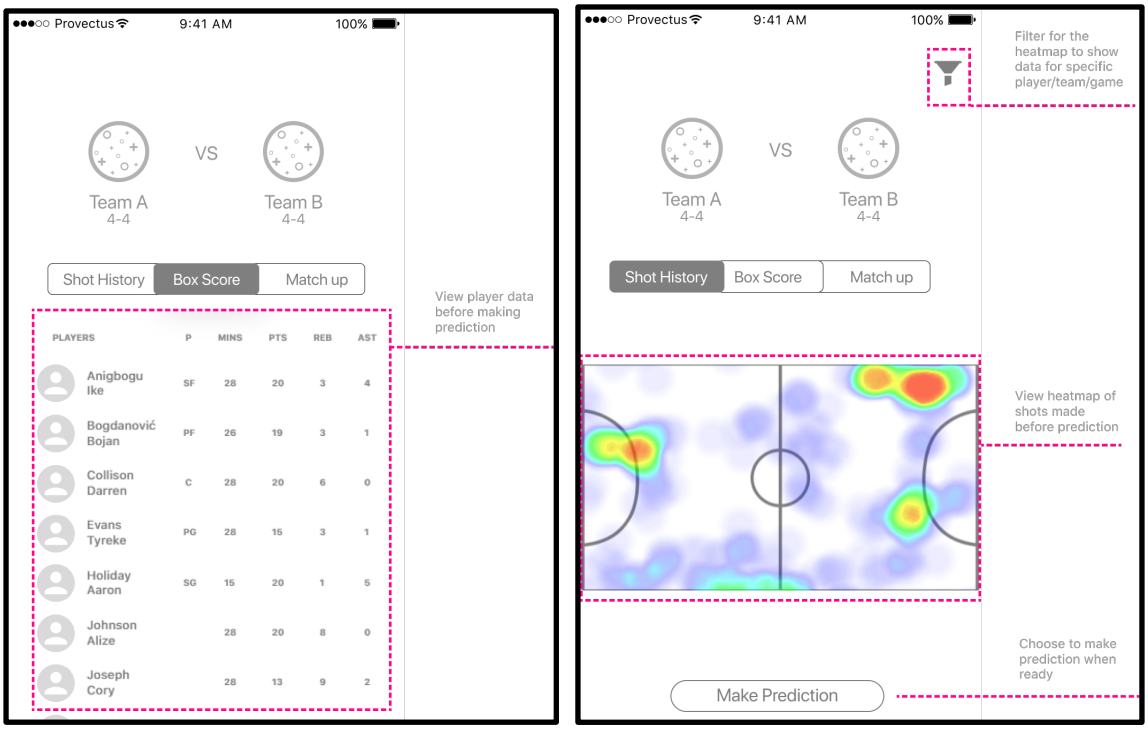
The main concept of our initial low-fidelity prototype was shot prediction and wagering.

Prototype Functionality



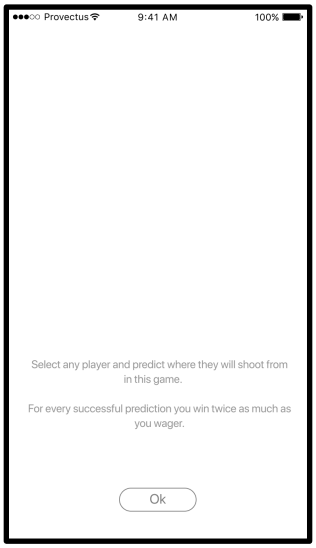
Screen A Screen B

- When user open the application, Screen A is the first screen that they'll see, where they can choose the type of service that they want.
- If they choose the Prediction & Wager, they can choose the team that they can want to wager on, as well as the date of the game.

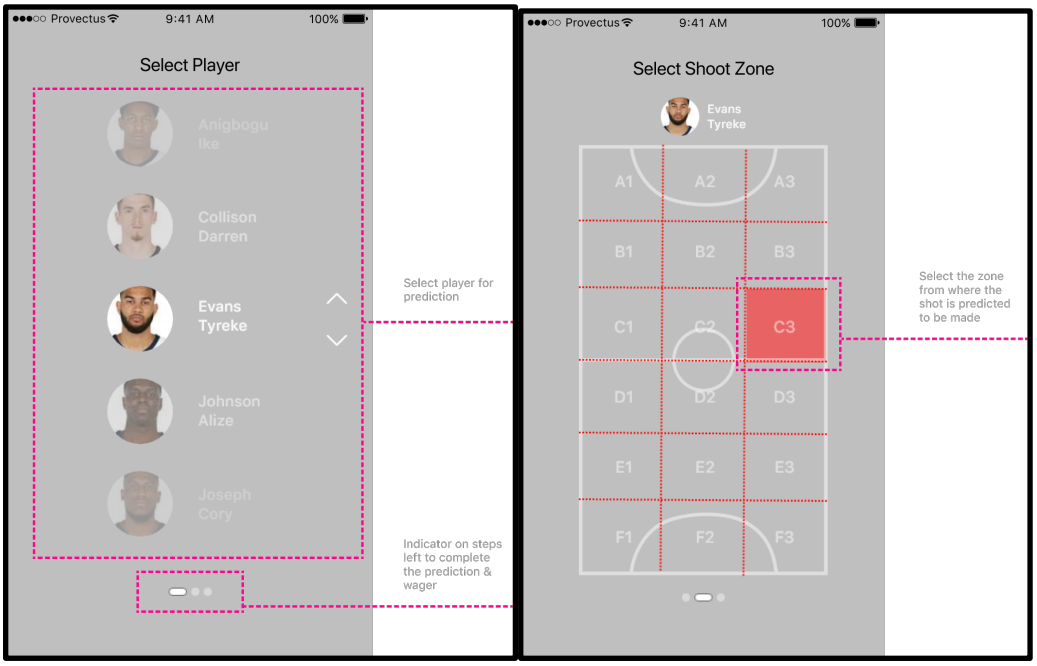


Screen A Screen B

- After they choose the team that they want to wager on, the next step is to view stats and successful shot history of the team. The Screen A (Box Score) is the statistics of the team and Screen B is the shot history of the team display in a heatform form. These feature allow users to determine where the next shot might come from, thus helping them predict the next shot.

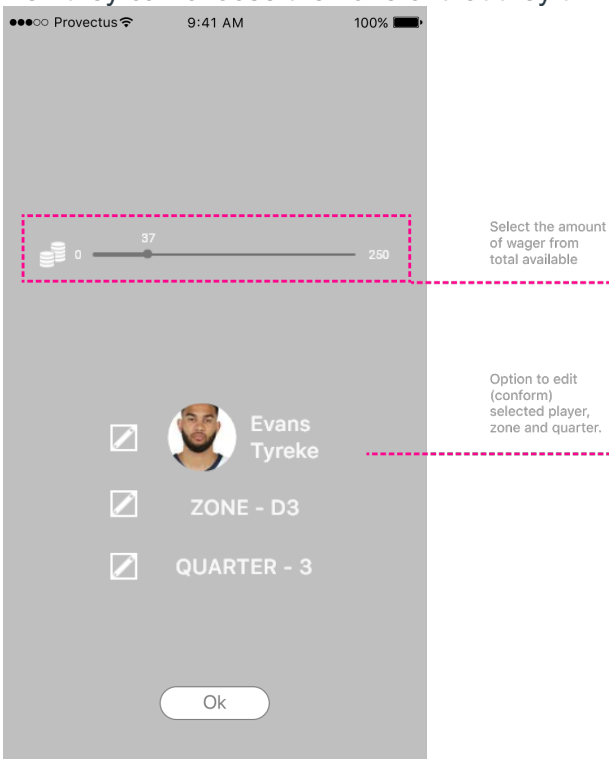


- After the user view the shot stats and shot history, they'll get a notification that remind them what they're signing up for.



Screen A Screen B

The user can then choose and select the player that they want to make a prediction and wager on. Then they can choose the zone of that they think will



Lastly, the user can choose the amount of tokens that they want to wager. The users also have the option to edit the player that choose, as well as the zone and the quarter.

9. User Testing of Low-Fidelity Prototype

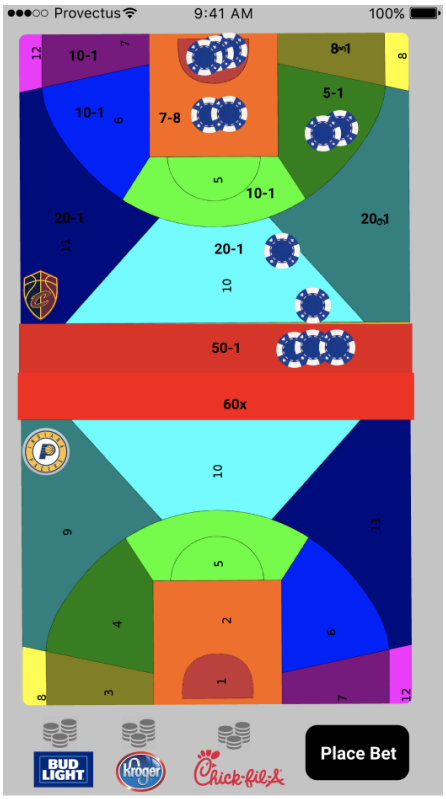
We conducted informal testing with two participants to obtain general sentiment from potential users on the prototype functionality.

The key insights were:

- Ability to select location on the court directly from heatmap screen.
- Need to show the rewards to motivate the user to play and wager.
- The navigation within the filter page need to be intuitive.

Next Design Iteration

After consideration of the User Feedbacks, a rapid new prototype was developed to address these issues (Direct Court Selection, Instant Rewards, Simplifies game, Choose by player or whole team). The significant changes made were also deemed necessary based on specific requirements from the product owner for the ability for sponsors to be able to engage with the fans.



A review of the technical REST API documentation of the Genius Sports stats collection software used by the NBA (http://developer.geniussports.com/warehouse/rest/index_basketball.html) identified the data types that will be available for high-fidelity prototyping. The Basketball playing court is divided into 13 distinct Action Areas for each side of the court. There are a variety of actions recorded as data points during a game. Both 2pt and 3pt shots can have 1 subtype assigned and any number of qualifiers (see table below).

In the prototype above users are able to select from a collection of three sponsor branded tokens and place those on the court in the different action areas. Once they are happy with the placement of their chips they select the place bet button. Then when if they have chips in the action area where the next shot comes from they receive a reward based on the multiplier for the action area.

The historical data for every shot taken by every player and teams as a whole is available so a calculation of the odds to be offered for each action area can be made. Displaying this multiplyer on the court allows the user to gauge how likely a shot is to come from there without have to look at the heat map. It may also be possible to offer the historical data presented as a heat map as a layer that can be turned on and off from this screen.

There are still issues to be resolved around if the user is predicting an individual players next shot or the whole team. There are advantages and disadvantages and additional design challenges with both.

2pt		**3pt**	
Sub Type	**Qualifier**	**Sub Type**	**Qualifier**
Dunk	2nd Chance	Fadeaway	2nd Chance

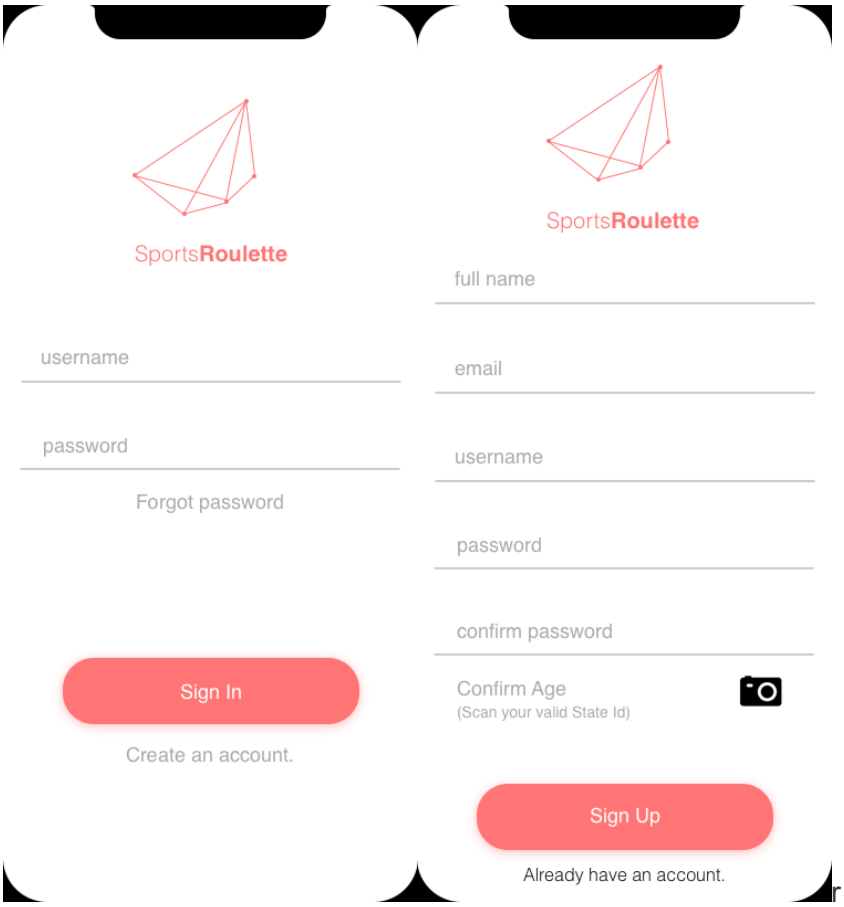
Layup	Fast Break	Jumpshot	Fast Break
Fadeaway	From Turnover	Floating jumpshot	From Turnover
Tipin	Points in the paint	Stepback jumpshot	Blocked
Jumpshot	Blocked	Pull-up jumpshot	
Alleyoop		Turn-around jumpshot	
Driving Layup			
Hookshot			
Floating jumpshot			
Stepback jumpshot			
Pull-up jumpshot			
Turn-around jumpshot			

The shots are also assigned an x, y coordinate on the court that is within one of the 13 action areas (see table below).

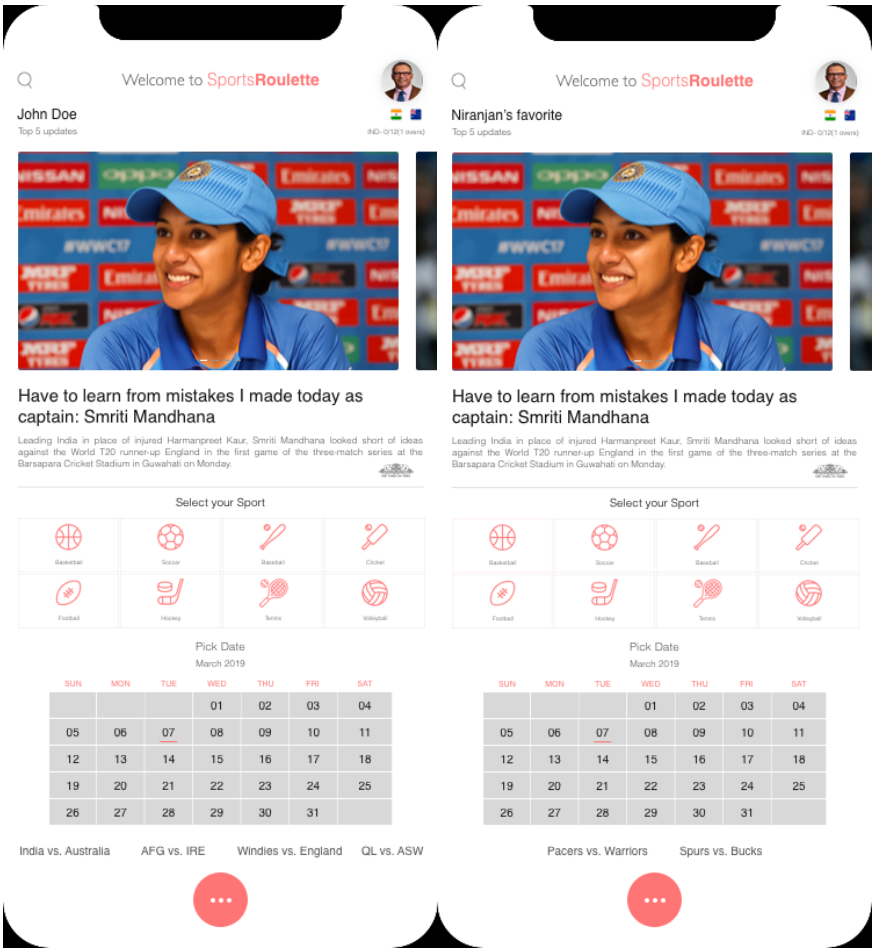
Court Number	Description
1	underbasket
2	inthepaint
3	insiderightwing
4	insideright
5	insidecenter
6	insideleft
7	insideleftwing
8	outsiderightwing
9	outsideright
10	outsidecenter
11	outsideleft
12	outsideleftwing
13	backcourt

9. High-Fidelity Prototype

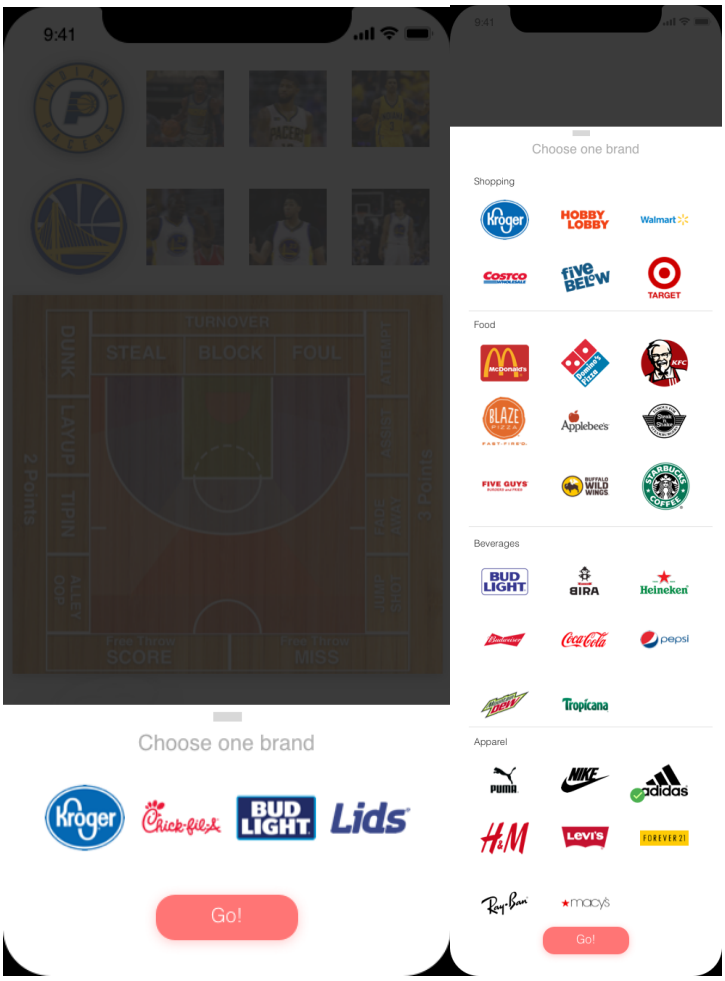
We fixed the issues our users suggested us during the pilot testing and developed the high-fidelity prototype. The concept of our high-fidelity prototype is related to the roulette concept. Here user has to predict the next shot in order to win.Here we are asking user to select the player they want to go with, for each player we have given the heat map from where user can identify the strenghts of the specific player. After selection of the player user needs to add some chips in the basket, user have to put at least 300 chips so as to lock the bet. Lock bet feature allow the user to place the chips on the areas they want and now they have to wait for actual shot to happen.



Introduction screens to create a username and password for the application. For existing user username and password are require but novice user should enter the full name, user name, password. Here we are also asking user to scan the valid state id so that we can confirm that they are above 18 years old.

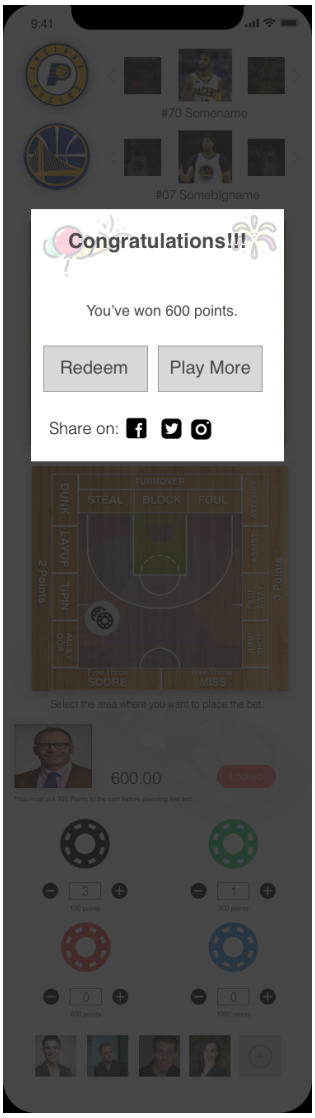


Observe your current daily sports news by swiping through the news feed. User can also see the live game score according to the matches going on here. In both the screens the calendar is shown the purpose of the calendar is to show the upcoming schedule of the sports. User can also filter the calendar according to the sport, when selecting particular sport the calendar shows only details about that particular sport only. User can select ongoing game on the list and play henceforth to win the prices.



First screen shows the top four sponsors we have and if user want to go for other sponsors other than that then can swipe up and see the entire list of sponsors according to categories. The categories which we have given are shopping, food, apparel. User needs to choose the sponsor for which you would like to potentially use your coins towards after gaining points from the gameplay.

The primary screen from our prototype is presented above. From this screen, the user can select a player from either team in a current game and then place the sponsor chips on one or more areas of the court to predict that the selected player will make the next shot from that area. Selections can be made only during a break in the game. The next made shot after that break determines the winning player/area. Identify which player you would like to play your wager on, and a player from your opponent and place your coin where you believe they are likely to score from.



With the help of this screen user can either share their experience on social media or use those points to play more. If user select the option play more then he or she can select the new sponsors or continue with the current one.

10. User Testing

Procedure:

We asked the test participants to complete a survey at the conclusion of the usability test. The overall focus of the survey was to gauge how comfortable users felt while using the prototype. Questions were primarily centered on frequency of use, ease of use, and functionality of the website. We used a 1 through 5 scale, with 1 being strongly disagree and 5 being strongly agree, to better accurately rate how the test participants felt.

Test Protocol:

Task 1: Sign into the application.

"Assume that you have just downloaded the application and want to start using it. You could create a new account but please use john as user name and iupui as password"

Task 2: Experience the homepage and select a basketball game to play roulette.

"Congratulations you have reached the main home screen of the Sports Roulette application. This is where you can check your account profile, read the latest news and select a game to play. Please take some time to explore what is available on the screen"

(Give the user time to explore the application)

"Now select the Warriors vs Pacers game and proceed to play the Sports Roulette mobile game"

Task 3: Engage in the basketball game and use the prototype to place a bet.

Step 1: "The game is already underway so please review all the sponsors available and use the prototype to select adidas as the company that will provide clothing as prize options if you become eligible for prizes."

Step 2: "Although the game has already started there is currently a time out on the court. Review the players then select player #2 from the Pacers, and select player #23 from the Warriors to place a wager on.

Step 3: "Choose player #2 from the Pacers, and player #23 from the Warriors and observe changes as you click through players available."

Step 4: "There is 30s left in the timeout so now select 600 of the Adidas tokens and lock in your bet for each player place them on the court where you think those players will shoot from next."

Task 4: Collect your prize and share your results on social media.

"The game resumes and you watch with your friends as the predictions you made are accurate. Collect your winnings from the game that just finished, and please share your results with friends on social media."

Results from User Testing:

Task 1:
Sign in was conducted with high easability and did not not have troubles. Concerns that were drawn from this task seemed to focus on the ability to work through the screen to type in individual names, when they were reminded to use the provided username and password.

- Future direction may need to focus on the ability to type in individual user names, and then move to the hotspot for an easier testing experience.

Task 2:

- Latest news was not directed to the user's preference, which allows for future design to provide a preference option in the user profile before reaching the home screen.
- Through guidance of the user tasks, the user was able to complete the task in the given time, with a positive response demonstrating ease of use to reach the basketball game, sponsor page.

Task 3:

- User's tend to swipe through the user rather than using the arrow provided to reach the next player for selection. This can be improved through redesign of a swipe through function or potentially the use of voice integration (for user's that know the player they want to play immediately.

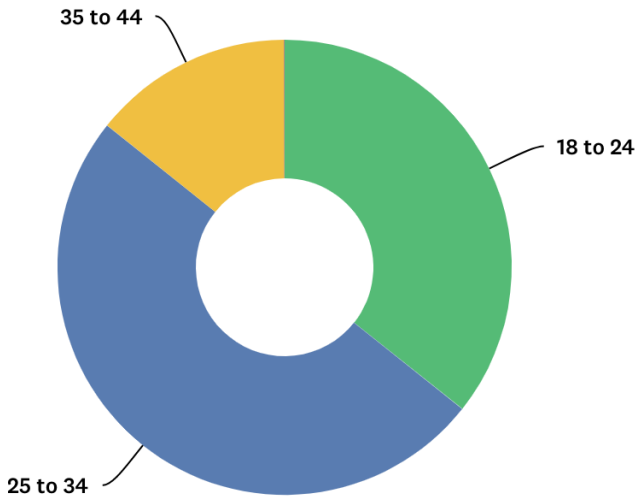
Task 4:

- User had wanted to know which prizes would be available, which was not presented in the prototype due to inability to connect with sponsor.
- The user enjoy's the fact that they have the ability to rejoin the game and continue playing, to gather up more points for future prize collection.
- User had expressed that they would like to see the value of points collected on the collection prize screen, to determine if it was worthy to cash in.
- All user's enjoy'd the ability to share their results on social, as social media was one aspect that they did not know was existent.
    - This demonstrates the need to show social earlier in the prototype.

Survey Results (14 Participants)

What is your age?

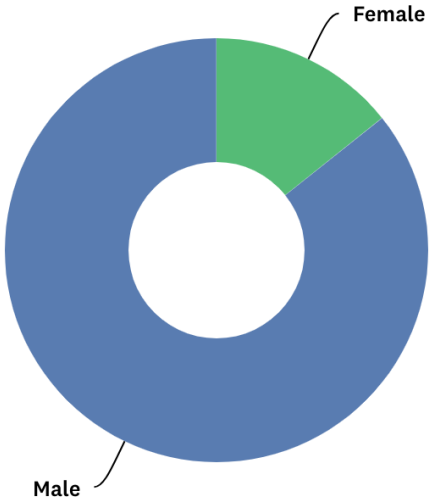
Answered: 14 Skipped: 0



ANSWER CHOICES	RESPONSES	
18 to 24	35.71%	5
25 to 34	50.00%	7
35 to 44	14.29%	2

What is your gender?

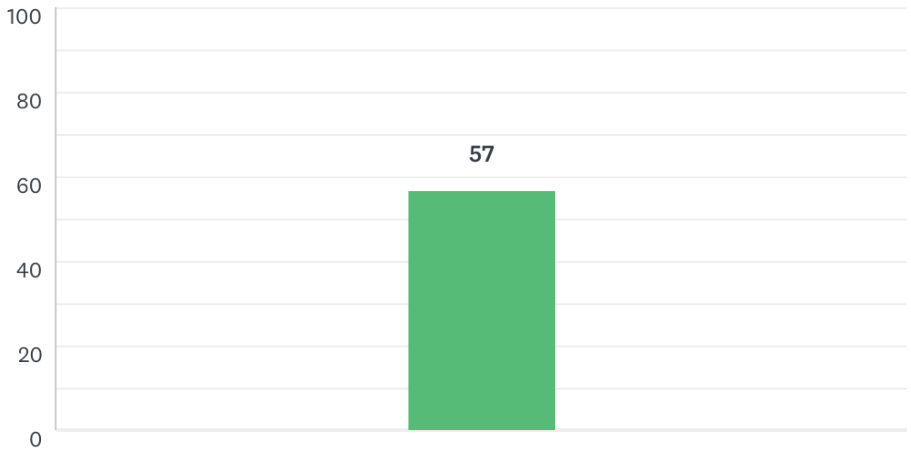
Answered: 14 Skipped: 0



ANSWER CHOICES	RESPONSES	
Female	14.29%	2
Male	85.71%	12
TOTAL		14

How likely is it that you would recommend this product to a friend or colleague?

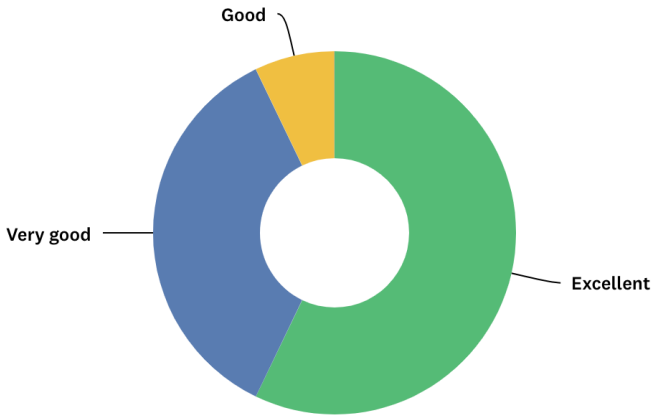
Answered: 14 Skipped: 0



DETRACTORS (0-6)	PASSIVES (7-8)	PROMOTERS (9-10)	NET PROMOTER® SCORE
7% 1	29% 4	64% 9	57

Overall, how would you rate the ease of use of this prototype?

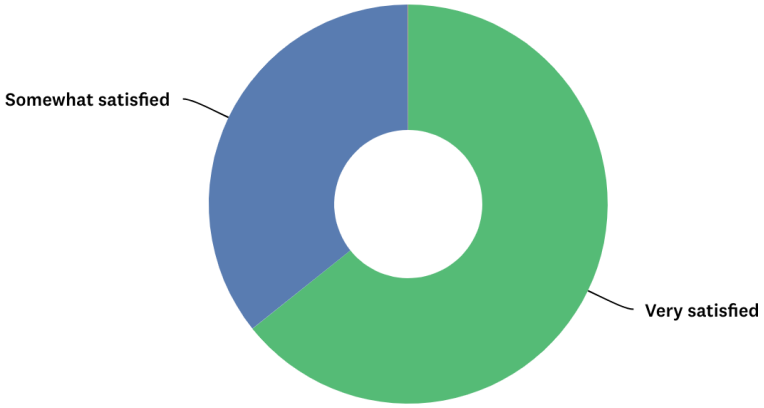
Answered: 14 Skipped: 0



ANSWER CHOICES	RESPONSES	
Excellent	57.14%	8
Very good	35.71%	5
Good	7.14%	1
Fair	0.00%	0
Poor	0.00%	0
TOTAL	14	

Overall, how satisfied or dissatisfied are you with the prototype?

Answered: 14 Skipped: 0



ANSWER CHOICES	RESPONSES	
Very satisfied	64.29%	9
Somewhat satisfied	35.71%	5
Neither satisfied nor dissatisfied	0.00%	0
Somewhat dissatisfied	0.00%	0
Very dissatisfied	0.00%	0
TOTAL		14

Comments:

-What user's liked;

- Ability to "guess" where the next shot may come from
- Potential ability to play in real time
- Learning about players by playing the game
- Viewing their news feed in the home page

-What user's felt needed improvement;

- Data visualization of shot history
- Understanding the different shot zones
- More player history and background data on the team's current status

11. Conclusions

We believe that our prototype provides a good, initial representation of user interactions to predict shot location for basketball games. It also provides an innovative way for sponsors to engage with the user experience of sporting events. Our testing results provided positive feedback, but also indicated issues that need to be addressed.

When conducting user testing, multiple responses indicated the need to go back to the user profile and check their progress. In testing we had assumed the user would utilize the hotspots through our own cognitive walkthrough. This information has provided the need for future direction and the need to provide more activate hotspots. Heuristic evaluations and cognitive walkthroughs after dissecting the user results will provide the necessary information for the final adjustments to have an efficient think aloud test with the user.

This concept was recognized as an innovative approach to live in-play fan engagement. Wagering on shot locations is not a betting market currently offered by any of the major bookmakers. The challenges around the timing of game play and opportunity windows available to place a bet may be a limiting factor for this concept. The technical challenges associated with integrating real world data with a prototype application limited the fidelity of user testing of this aspect of the concept. Further work is needed to enhance the current prototype to a level that would permit such testing.

Our team, in partnership with MAX, plans to continue design iteration and testing to improve simplicity in the user flow. A higher-fidelity prototype would provide for a more realistic user experience that is based on a “live” game.

Changes proposed for the next design iteration include:

- Integrate point history into the user profile screen.
- Develop a user-friendly chip-placement that considers accessibility issues.
- Improve the visibility of the shot clock and time left to place a bet.