



**DEVELOPMENT OF A MOBILE APP
TRACKING STATS AND GOALS OF
YOUNG BASKETBALL PLAYERS:
DESIGN-BASED RESEARCH
Ph.D. Dissertation**

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Eskişehir 2023

**DEVELOPMENT OF A MOBILE APP TRACKING STATS AND GOALS OF
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Ph.D. DISSERTATION

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FINAL APPROVAL FOR THESIS

This thesis titled “Development of a Mobile App Tracking Stats and Goals of Young Basketball Players: Design-Based Research” has been prepared and submitted by Ramazan TAŞÇIOĞLU in partial fulfillment of the requirements in “Anadolu University Directive on Graduate Education and Examination” for the Doctor of Philosophy (PhD) in Physical Education and Sports Department has been examined and approved on 06/06/2023.

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ÖZET

GENÇ BASKETBOL OYUNCULARININ İSTATİSTİKLERİNİ VE HEDEFLERİNİ TAKİP EDEN BİR MOBİL UYGULAMANIN GELİŞTİRİLMESİ: TASARIM TABANLI ARAŞTIRMA

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Araştırmanın amacı genç erkek basketbol oyuncularının istatistiklerini ve hedeflerini takip eden bir mobil uygulama geliştirmektir. Tasarım tabanlı olan bu araştırma: tasarımın planlanması, oluşturulması ve geliştirilmesi aşamalarından oluşmaktadır. Planlama aşamasında literatür analizi, hedef kullanıcıların dijital özelliklerinin analizi, norm geliştirme analizi, rakip analizi ve paydaş (yazılım geliştiricisi ve logo tasarımcısı) görüşmeleri kullanılmıştır. Geliştirme aşamasında yazılım geliştiricisinin kullandığı teknolojiler ve ilk tasarım sunulmuştur. İyileştirme aşamasında ise, oyuncuların uygulamaya dair deneyimleri ve görüşleri nitel kullanılabilirlik testi ile analiz edilmiştir. Ayrıca, her üç aşamanın tüm nicel ve nitel bulgularını birleştirmek için karma yöntem bütünleştirici analiz olarak ortak gösterim ve anlatı kullanılmıştır. Genel olarak, planlama aşamasında elde edilen bulgular, geliştirme aşamasında kullanılırken; planlama ve geliştirme aşamasının bulguları, tasarımın iyileştirme aşaması için kullanılmıştır. Sonuç olarak, Stats&Goals isimli mobil uygulamanın oyuncuların maç performansı istatistiklerini izlemelerine, performanslarını akranlarıyla karşılaştırmalarına ve bireysel olarak performans hedefleri belirlemelerine yardımcı olduğu bulunmuştur. Ayrıca, araştırma sonucunda benzer uygulamaların geliştirilmesi için bir protokol önerisi sunulmuştur.

Anahtar Sözcükler: Mobil uygulama, Hedef belirleme, Sosyal karşılaştırma, Norm geliştirme, Genç erkek basketbolcular.

ABSTRACT

DEVELOPMENT OF A MOBILE APP TRACKING STATS AND GOALS OF YOUNG BASKETBALL PLAYERS: DESIGN-BASED RESEARCH

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The aim of the research was to develop a mobile application that tracks the statistics and goals of young male basketball players. This design-based research consists of three phases: planning, developing, and improving the design. In the planning phase, literature analysis, target users' digital characteristics analysis, norm development analysis, competitor analysis, and stakeholder (software developer and logo designer) interviews were used. In the development phase, the technologies used by the software developer and the initial app design were presented. In the improvement phase, the experience and opinions of the players for the application were analyzed with the qualitative usability test. Furthermore, joint displays and narrative were used as mixed method integrative analysis to combine all the quantitative and qualitative findings of all three phases. Overall, while the findings of the planning phase were used for the development phase; the findings of the planning and development phase were used for the improvement phase of the design. In conclusion, the mobile app named Stats&Goals was found to help players track match performance statistics, compare their performance with their peers, and set performance goals individually. Furthermore, a protocol was recommended for the development of similar applications.

Keywords: Mobile application, Goal-setting, Social comparison, Norm development, Young male basketball players.

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My Ph.D. journey was a dream of a Dreamer come true – couldn't be better!

Thank you.

06/06/2023

STATEMENT OF COMPLIANCE WITH ETHICAL PRINCIPLES AND RULES

I hereby truthfully declare that this thesis is an original work prepared by me; that I have behaved in accordance with the scientific ethical principles and rules throughout the stages of preparation, data collection, analysis and presentation of my work; that I have cited the sources of all the data and information that could be obtained within the scope of this study, and included these sources in the references section; and that this study has been scanned for plagiarism with “scientific plagiarism detection program” used by Anadolu University, and that “it does not have any plagiarism” whatsoever. I also declare that, if a case contrary to my declaration is detected in my work at any time, I hereby express my consent to all the ethical and legal consequences that are involved.

Ramazan TAŞÇIOĞLU

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LIST OF SYMBOLS AND ABBREVIATIONS

ANOVA	: Analysis of Variance
ADR	: Action Design Research
ANCOVA	: Analysis of Covariance
ANOVA	: Analysis of Variance
API	: Application Programming Interface
App	: Application
ARDAT	: Academy of Research, Design, and Training
BMI	: Body Mass Index
BYL	: Basketball Youth League
C	: Center
CET	: Cognitive Evaluation Theory
CI	: Confidence Interval
DBR	: Design-Based Research
Df	: Degree of Freedom
ES	: Effect Size
F	: ANOVA F Score
FIBA	: Fédération Internationale de Basketball Association-The International Basketball Federation
HTTP	: The Hypertext Transfer Protocol
JSON	: JavaScript Object Notation
KOSGEB	: Small and Medium Enterprises Development and Support Administration
MEB	: The Ministry of National Education
METIOD	: Mersin Tourism Alumni Association
MS	: Mean Square

MVC	: Model-View-Controller
MVP	: Most Valuable Player
n	: Sample
NBA	: National Basketball Association
p	: Significance Level
PER	: Player Efficiency Rating
PF	: Power Forward
PG	: Point Guard
REST	: Representational State Transfer
Sd	: Standard Deviation
SDT	: Self-Determination Theory
Sec	: Second
SF	: Small Forward
SG	: Small Guard
SPSS	: Statical Package for Social Sciences
SQL	: Structured Query Language
SS	: The Sum of Squares
TBF	: Turkish Basketball Federation
TÜBİTAK	: Scientific and Technical Research Council of Türkiye
U16	: Under 16
UCD	: User-Centered Design
UX	: User Experience
XML	: Extensible Markup Language
η^2	: Eta square
$\bar{x}$	: Mean

1. INTRODUCTION

This chapter includes (i) problem statement, (ii) purpose of the research, (iii) research questions, (iv) significance of the research, (v) delimitations, (vi) limitations, (vii) assumptions, and (viii) definitions and abbreviations of the research.

1.1. Problem Statement

According to the "Digital 2023: Türkiye" report (Kemp, 2023), Türkiye's total population was 85.59 million ($\text{Age}_{\text{median}} = 31.6$ years) in January 2023. 7.5% of Türkiye's population is between the ages of 13 and 17. There are 81.6 million (95.4%) mobile users, 71.38 (83.4%) million internet users, and 62.55 (73.1%) active social media users. Compared to the previous year, the population increased by 0.6%, the number of mobile users increased by 3.2%, and the number of internet users increased by 0.6%. The rate of individuals aged 16-64 who own a smartphone is 97.6%. Some of the main reasons for using the Internet by individuals 16-64 age: finding information (73.2%), keeping up-to-date with news and events (67.6%), staying in touch with friends and family (58.3%), and education and study-related purposes (49.5%). The reports (Kemp, 2022, 2023) highlighted that the above rates have increased each year.

Özsarı and Saykılı (2020) expressed that users defined mobile learning as time and place-independent, easy, fun, flexible, engaging, portable, and engaging. Furthermore, they highlighted many “digital native” users prefer mobile learning because of these characteristics of mobile learning in Türkiye. These studies showed that there are great changes in the trends of users, especially young ones, to access information. So, these trends should be noted and changes/interventions should be made by considering their trends to be more likely to be accepted by users. This principle, which covers all users, also includes athletes. In this context, the use of mobile applications in order to improve the performances of athletes is becoming increasingly common today. Many mobile applications are used to measure and track the fitness performances of athletes. The use of a mobile application based on the goal-setting approach in order to follow and support the technical and tactical training processes in basketball is a new method compared to the applications used for conditional purposes.

Goal-setting theory in sports is one of the approaches that can be used to support athletes psychologically (Locke and Latham, 2013). This approach expresses the

motivational support that enables players and teams to focus more on outcome, performance, and process goals. Determining goals for players and teams to improve their performance based on competition statistics will enable them to stay in flow by regulating their motivation, as well as regulating their training, and thus improving their technical and tactical development.

A goal-setting meta-analysis (Kyllo and Landers, 1995) for the sport and exercise psychology literature found that goal setting is an effective technique in changing behavior in a positive way. Many authors (Burton and Raedeke, 2008; Locke and Latham, 2013; Weinberg and Gould, 2010; Widmeyer and Ducharme, 1997) recommend using many types of goals for effective goal setting, along with the feedback and evaluation of goals. These performance feedbacks (notifications) help players get motivated and take action. As a result of this, Fogg behavior model cycle may be repeated in order and basketball-specific behaviors may change in the desired direction.

The National Basketball Move Project suggested many issues about Turkish basketball. One of them was to increase the number of qualified Turkish players and establish a youth development league for it (Tınaz et al., 2017). The Basketball Youth League was established in the same year ([http-1](#)). The league aims to support young Turkish basketball players to prepare for a professional career by having more playing time. In the last five years, it helped around 20% to this aim ([http-2](#)). It is thought that these applications may increase this rate and help the professional careers of the players. In other words, mobile apps according to their lifestyles may support young basketball players' sports careers and guide how to use WEB 2.0 applications for their sports careers. In this context, a mobile application may help players track match performance statistics, set performance goals individually, and compare their performance with themselves and their peers.

1.2. Purpose of the Research

The overall purpose of this research was to develop a mobile application for youth basketball players. This research utilized design-based research which integrated quantitative and qualitative methods to develop an explanation of the experience of the players regarding the norms used in the design of the application.

1.3. Research Questions

The main research question guiding this design-based research was:

How a mobile app can be developed to support youth players' efficiency?

The following research questions written according to the phases of the research are listed below. In addition, due to the nature of mixed methods research, there is a research question that integrates both phases and methods.

1.3.1. Planning phase

Quantitative and qualitative questions to be answered in the context of need assessment and norm development at the planning phase of the research are as follows:

1- *What is the conceptual and theoretical framework needed to develop a mobile app?*

2- *What are the digital characteristics of the mobile app target users?*

3- *What are the norms which are developed as goals for young players?*

The sub-questions used to guide the third main research question are as follows:

3.1. Is there a significant difference between the efficiency scores in terms of seasons?

3.2. Is there a significant difference between the efficiency scores in terms of age?

4- *What are the functions of similar apps to the mobile app?*

The sub-question used to guide the forth main research question are as follows:

4.1. What are the gamification components in similar applications?

5- *What are the developers' opinions on app design?*

1.3.2. Developing phase

Qualitative question to be answered in the developing phase of the research are as follows:

1. *What are the technologies used to develop the mobile app?*

1.3.3. Improving phase

Qualitative question to be answered in the improving phase of the research are as follows:

- 1. What are the mobile app opinions and experiences of the players?*

1.3.4. Mixed methods integration question

The mixed methods integration question to be answered in the research are as follows:

- 1. How do participants' opinions and experiences on the mobile application contribute to the products of the norm and app development processes?*

1.4. Significance of the Research

This research has implications for multiple communities of research and practice. First, it makes a significant substantive contribution to youth basketball. This research urges all stakeholders interested in youth basketball such as players, coaches, managers, clubs, and federations to improve and innovate their monitoring and training practices. Especially, it urges youth players to consider ways in which they can become better learners and adopters of WEB 2.0 applications during their sports career. Second, this research makes a significant substantive contribution to the community of sports scientists and encourages them to do multidisciplinary research by providing evidence for multidisciplinary research. Third, as design-based research with a user-centered design, it contributes to both mixed methods research and product-oriented research with its unique process, with the application and protocol developed.

1.4.1. Substantive contribution to the youth basketball

A project called the National Basketball Move was started to address basketball-related issues following the elections for the Turkish Basketball Federation. As a result of this project, the National Basketball Move research report was published (Tınaz et al., 2017).

One of the aims of the report is to increase the number of elite athletes. Through this aim, one of its suggestions for this is the establishment of a youth development league (Tınaz et al., 2017). In this direction, the Basketball Youth League was established in the same year (http-1). The league aims to support young Turkish

basketball players to prepare for a professional career by having more playing time. In the last five years, it helped around 20% to this aim (http-2). In other words, one out of every five athletes started playing in the top leagues. It is thought that the application to be developed as a result of this research will increase this rate and help the professional careers of the players.

In addition to the problems with the development of athletes, four more problems are declared in the report. These are management and organizational problems, ethical and moral problems, structural problems, and problems with the education system. It is thought that the application will directly support the management and organization problems and the problems with the development of athletes, and indirectly support others. In particular, it is thought to help with short-term goals and poor decision-making problems in clubs, which are two management and organizational problems in the report. It may help the establishment of a corporate environment in clubs that support making objective decisions based on data and setting effective team-specific goals. Furthermore, it may help to acquire goal-setting behavior in youth sports environments. In addition, the norms developed at the end of this research can also be used in the talent selection processes of young male athletes, regardless of the application.

1.4.2. Substantive contribution to the community of sports sciences

This research is design-based research based on user-centered design. Since the aim of the research is to develop an efficient app specific to youth male basketball, an app will be produced at the end of the research. In this context, it differs from most quantitative or qualitative research, which is produced in sports sciences. In addition, since the development processes of the design are reported in DBR as a protocol and a recommendation, it presents an example for sport science researchers who want to develop similar applications. Furthermore, it brings together multidisciplinary skills and perspectives. In other words, it encourages sports scientists to work with experts from different backgrounds for multidisciplinary research.

A recommendation (Durdubaş, 2020) shows that this research will help fill a gap in the literature. Durdubaş investigated the effect of a season-long multi-level goal-setting intervention on team variables in his dissertation. At the conclusion part of his dissertation, Durdubaş proposes to investigate tracking individual goals and feedback

that are determined by performance statistics through mobile applications. It is expected that the app developed in this dissertation could be used to find an answer to this question.

1.4.3. Methodological contribution to the field of mixed methods research

Design-based research (DBR) is defined as a systematic but flexible methodology by iteratively analyzing, designing, developing, and implementing new ideas. This methodology allows using of multiple data collection methods, theories, and stakeholders in the research process. There is not only one DBR, so it is defined as a methodology (Wang and Hannafin, 2005). This design-based research with a user-centered design had three phases integrated quantitative and qualitative methods to develop a mobile app. At the end of these three phases, it provided an explanation of the players' experience regarding the norms employed in the mobile app's design. Furthermore, this research brought together many stakeholders such as basketball players, basketball coaches, and official statisticians of TBF. And, it covered many theories and concepts such as team development linear theory, goal setting theory, cognitive evaluation theory, social comparison theory, intrinsic motivation, Fogg behavior model, gamification, basketball statistics, and WEB 2.0 applications. Third, this research makes a methodological contribution to the field of mixed methods research in sports sciences. It shows how multiple data collection methods can be used in DBR as well as showing that there is no single DBR.

1.5. Delimitations

This dissertation explained to develop a player mobile app that gives the statistics of young male basketball players as feedback, allowing players to set their own goals, and make social comparisons. Through its conceptualization, it was delimited with team development linear theory, goal setting theory, cognitive evaluation theory, social comparison theory, Fogg behavior model, gamification, basketball statistics, and WEB 2.0 applications.

Based on these theories and concepts, there is no obstacle to the use of the WEB 2.0 mobile app for both genders, and both male and female players could benefit from the app. However, the performance statistics of female players began to be published as of the 2020-2021 season (<http-3>). Since two seasons of data on women would not be sufficient for all variables on norm development, only male players were included in the

research. Therefore, it covers only youth male players and their coaches. The research was conducted on youth male basketball players in the last five seasons of the BYL. Interviews were delimited to basketball players. In addition, basketball coaches gave their opinions on the norms as experts.

Norm development was delimited to the last five seasons' data of BYL (2017-2022 seasons) ([http-4](#)). These data are collected by TBF statistics officers during matches and then published on the TBF official website. Two statistics officers who completed the match statistics training collect the data. Statistics are checked with intercoder consistency and coded as game statistics. These statistics were used for norm development as secondary data.

1.6. Limitations

Players' stats were collected from the official website of the Turkish Basketball Federation for the norm development phase. During these five seasons, some issues that may affect player stats were taken. Since Trabzonspor withdrew from the league in the 2018-2019 season ([http-5](#)), a total of 19 teams competed that season. While the 2019-2020 season was interrupted due to the COVID-19 pandemic ([http-6](#)); the 2020-2021 season was played with the short season (bubble) method due to the measures taken for the COVID-19 pandemic ([http-7](#)). To minimize the effect of these differences on norm development, player statistics were divided by the number of matches.

Furthermore, the efficiency score used by TBF was adopted in the research for compliance with the statistic web pages of the TBF. There are many efficiency scores in the literature ([http-8](#)). Although using the efficiency score used by TBF is useful for users, it may have a limitation in terms of explaining adequately game performance stats.

Experts for norm development were selected purposively with snowball sampling.

Players for interviews were selected with nested sampling. Although the maximum variation sampling was followed for representing all the players' opinions involved in norm development analysis in nested sampling. However, maximum variation sampling maximized the range of perspectives of the participants in this research compared to other purposive sampling methods and represented all opinions

from each efficiency norm group in the planning, developing, and improving phases of the app design.

The limited budget of the project caused to hire a single software developer. As a result, there were some delays in the development processes. Despite these delays, the application has been successfully developed.

1.7. Assumptions

In this research, the following assumptions were accepted:

- It was assumed that these statistics were published on the TBF official website with minimum error.
- It is assumed that all participants answered the questions about their experiences regarding the mobile app as honestly as possible.
- It is assumed the technology literacy levels of the users were similar and sufficient.

Chapter 1 presented the introduction. While Chapter 2 presents the literature of this research, Chapter 3 presents the method of this research. Chapter 4 presents research findings, while Chapter 5 presents the sections of discussion, conclusion, and recommendations.

2. LITERATURE

In this chapter, an overview of the conceptual and theoretical framework utilized for the development of the application are given. The major topics include: (i) team development linear theory, (ii) goal setting theory, (iii) cognitive evaluation theory, (iv) social comparison theory, (v) Fogg behavior model and gamification, (vi) basketball statistics and efficiency, and (vii) WEB 2.0 applications.

2.1. Team Concept and Team Development Linear Theory

A team is a group of people that must interact with each other to achieve a common goal (Carron and Hausenblas, 1998). In addition to the distinguishing properties of mutual interaction and task interdependence, teams have four characteristics (Weinberg and Gould, 2010):

- Collective sense of identity - "We-ness" rather than "I-ness".
- Roles are distinct— All members know what they're supposed to do.
- Structured ways of communication - Communication lines.
- Norms - Social rules that guide members on what they should and shouldn't do.

Two of the key characteristics are team roles and team norms. A study showed that these characteristics as role clarity and acceptance and group norms were correlated with team cohesion (L. J. Martin et al., 2013). One of the important strategies to improve cohesion in sports environments is to focus on group norms and individual roles which are two team characteristics (Kocaekşi, 2015).

2.1.1. Team roles

A role is a collection of actions that are required or expected of a player in a specific position on a team. Athletes have different roles within their teams. Knowing what one's role is within a team and how to perform that role makes for a stronger group. There are two roles in teams as formal and informal roles. Formal roles emerge from the nature and structure of team sports while informal ones come from interactions among group members (Weinberg and Gould, 2010). For example, in basketball, point guard, forward, and center positions are official roles, and they each have distinct responsibilities on a team. Each role has its own set of requirements. Individuals are typically hired or trained to fill specific responsibilities.

Role clarity and role acceptance are two key factors in team building. While it is important for the players to understand their roles, to fulfill their responsibilities of the role (Beauchamp et al., 2005); clarifying and accepting their roles is important to increase a team's effectiveness and enhance a team structure (Weinberg and Gould, 2010). Therefore, it is important for the team's effectiveness that the players clarify and accept the roles. Clarifying the roles ensures that the players are more satisfied with their roles; it will make players show less social loafing (Weinberg and Gould, 2010).

Coaches are in charge of persuading individual players to play together as a team, and they must be aware of how team dynamics effect performance on the athletic field or court for maximizing individual performance in team (Weinberg and Gould, 2010). Coaches can guide players to accept their roles by minimizing the status differences among roles and by emphasizing that the team's success is dependent on each individual's contribution. Role acceptance is influenced by four factors: (a) the ability to apply specialized skills or competencies; (b) feedback and role recognition; (c) role significance; (d) autonomy, or the opportunity to work independently. Players, for example, are more inclined to accept and carry out their responsibilities if they believe they are making a significant contribution to the team's success (Weinberg and Gould, 2010).

The Chicago Bulls of the 1990s and the Boston Celtics of the 2008s were given as a basketball example for the importance of role clarity and role acceptance (Weinberg and Gould, 2010). While Michael Jordan and Scottie Pippen were the team's leaders and most talented players in those years, other players such as Dennis Rodman, Ron Harper, and Steve Kerr believed their rebounder, defensive specialist, and shooter roles. They achieved a long-term outstanding success in the 1990s. Similarly, while the Boston Celtics had Paul Pierce, Kevin Garnett, and Ray Allen as “the big three”, the rest of the players accepted their roles on the team. And they were in the finals of the NBA (National Basketball Association) championship of 2008.

2.1.2. Team norms

While the norm is "written and unwritten group rules" in sociology; In psychology, it is expressed as "the behavior summary of a group". Norms should be based on statistical results at the end of an empirical process (Erkuş and Selvi, 2019). Norms can be formally created or formed informally by a group. Individuals usually

receive pressure to adhere to their group's norms, whether the norm is seen as relevant or irrelevant. There are norms irrelevant to the team's goals, such as "carry the balls" (the norm that rookies must carry balls), and there are norms such as productivity norms that are related to the teams' goals.

2.1.2.1. Productivity norms

The standard for effort and performance agreed by the team is known as the productivity norm. Productivity norms were the norm most frequently indicated for competitions, practice, and the off-seasons (Munroe et al., 1999). In sports settings, the captain or top performer on a team is frequently a role model who sets the productivity norm.

2.1.2.2. Positive norms

Two elements are crucial in setting team norms: the source of communication to change the norms and the nature of communication. The individuals in a group who have the power of persuasion are those who are more believable, better liked, similar to other group members, attractive, have a high rank, or are perceived as powerful. The other crucial element, the nature of communication is also important. The process of modifying group norms is more effective when people from all sides of the argument are present, there are multiple communications, communication is novel, and conclusions are conveyed unambiguously (Kağan, 2015).

2.1.3. Team development linear theory

Becoming a team is a gradual process. There are three theories to explain this gradual process in the team development literature (Weinberg and Gould, 2010): (i) linear theory (teams develop in stages), (ii) cyclical theory (teams follow a cyclical pattern), and (iii) pendular theory (teams develop in a pendulum-like manner).

The linear theory includes that the teams go through stages in order. There are four stages in this theory: (i) forming stage, (ii) storming stage, (iii) norming stage, and (iv) performing stage. Although many teams go through these stages; the duration of each stage and the sequence that the stages follow may differ from one team to another in the process of team development (Weinberg and Gould, 2010).

The forming stage is the stage where team members meet other team members. At this stage, team members make social comparisons by evaluating each other's strengths

and weaknesses. For example, basketball players can compare the playing times or efficiency scores of their teammates. This comparison also helps players decide whether they belong to the group or not. If they decide that they belong to the group, they want to define their role in the group. The storming stage is associated with interpersonal conflict and resistance to the leader and the team. Emotional resistance may occur when the roles of individuals and leaders become clear. In this stage, it is better to communicate with team members objectively and openly. The norming stage is characterized by solidarity and cooperation. In this stage, a sense of unity forms. Rather than being concerned about their own well-being, the athletes work together to achieve shared goals. Players compete for efficiency of effort and task effectiveness rather than for prestige or recognition. The performing stage is the stage that team members band together for team success. The team focuses on problem-solving, using team components and collaborations to work on tasks and test new ideas. In this stage, roles are well defined, structural issues are resolved, interpersonal connections are stabilized, and structural concerns are resolved (Weinberg and Gould, 2010).

2.2. Goal Concept and Goal Setting Theory

The goal is to reach a certain proficiency standard within a certain period of time (Locke and Latham, 2002). According to goal setting theory, a goal is the object or purpose of an action and the main source of one's motivation (Locke and Latham, 2013).

2.2.1. Goal types

Many types of goals are used in team and performance sports (Burton and Raedeke, 2008; Locke and Latham, 2013; Weinberg and Gould, 2010). These are as followed: objective and subjective goals; short-term and long-term goals; outcome, performance, and process goals; practice and competition goals; individual and team goals.

2.2.1.1. Objective and subjective goals

Goals are divided into objective and subjective goals for individuals interested in sports and exercise. While the objective goal is the willingness to achieve a certain standard in a certain task in a certain time period; the subjective goal is a goal that

contains purpose-oriented statements but is not objective and cannot be measured (Weinberg and Gould, 2010).

2.2.1.2. Short-term and long-term goals

Long and short-term goals are explained with the metaphor of the summit or staircase (Burton and Raedeke, 2008; Weinberg and Gould, 2010). Long-term goals guide athletes with direction to the top of these metaphors, while short-term goals help them to get their destination with a sequence of progressively linked. Although these two types of goals have separate meanings, they should be linked. In addition, it is recommended that short-term goals should not be longer than 6 weeks and long-term goals can be one, two, or even more years (Burton and Raedeke, 2008).

2.2.1.3. Outcome, performance, and process goals

In another sports and exercise goal classification (Hardy et al., 2018) goals are divided into three groups as outcome, performance, and process goals.

Outcome goals that focus on results, such as winning the match, beating the opponent, or being on the podium, fall into this category. Therefore, outcome goals depend not only on your own performance but also on your opponent's performance and the outcome of the competition. For example, you may fail in your goal of winning the game despite playing your best game of the season.

Performance goals are the goals that include the performance standards determined by the athlete by comparing their previous performances, regardless of the opponent and the competition. Increasing the free throw percentage for the previous season from 50% to 70% is an example of a performance goal.

Process goals focus on the movements that the athletes should perform in the process of showing athletic performance. An example of this is when a basketball player aims to shoot at the highest point of the jump.

Athletes and exercisers should set all three types of goals, because outcome, performance, and process goals have crucial roles in directing behavioral change in a positive way (Hardy et al., 2018).

Recommendations for setting outcome, performance and process goals (Weinberg and Gould, 2010):

- Outcome goals may cause short-term motivation.
- Outcome goals may increase anxiety and extraneous distractions before or during competition.
- It is easier to adjust performance and process objectives while it is difficult to adjust outcome goals.
- Setting performance and process goals are very beneficial both while exercising and competing.

The important thing is to know which goal type can be useful at which stage of behavior change. Filby, Maynard, and Graydon (1999) state that it is beneficial to adopt all three types of goals, rather than adopting a single goal type. According to these results, all three types of goals should be ranked in order of importance and employing different types of goals according to need at different times is more effective for improving performance. Furthermore, fixed ideas or attitudes about success or failure can develop if one is focused on a single goal like winning a particular contest or match (Karageorghis and Terry, 2011).

2.2.1.4. Practice and competition goals

In a performance sports environment, there are two other types of goals: practice and competition goals. While practice goals focus on the quantity or quality of skill mechanics of the training, they encourage athletes to go beyond their comfort zone. On the other hand, competition goals are set related to athletes' previous performances or opponents' performances. Athletes have less control over these goals than training goals. While practice goals could be set as an outcome, performance, or process goal; the competition goal could be set only as a process or performance goal (Burton and Raedeke, 2008).

2.2.1.5. Individual and team goals

In team sports, there are goals for both individuals and teams. These goal types are similarly effective in performance enhancement (Locke and Latham, 1990, 2013). In the context of team sports, both are influenced by the goals of the team. This means that individuals who are part of a team set goals in the context of that team's goals. Moreover, team goals are not only the sum of the individual goals of group members; they are shared perceptions about a desired condition for the group as a unit.

Group/team goal is the future state of the members in the group/team that they desire for group success and are working towards. In other words, it is the attainment of certain standards of group competence in a certain period of time (Weinberg and Gould, 2010). Goals such as being the champion in the basketball development league or increasing the efficiency score of the basketball team can be given as examples of group goals.

Four types of goals are mentioned in groups (Zander, 1996) and team sports (Dawson et al., 2002). These:

- Team member's goal for himself
- Team member's individual goal for the team
- The goal of the team or group
- The team/group goal for the team member

Goal setting is an empirically proven phenomenon to achieve teams' goals. Coaches should use athlete input in setting and developing team goals. This strategy increases commitment to achieving goals (Weinberg, 2010).

Group goals create behavior change by increasing motivation and cohesion. A study had three conclusions in their study with basketball, hockey, swimming, and volleyball team (Brawley et al., 1993). Team cohesion increases if players perceive that their teams have set team goals for the competition. Additionally, if these team goals are satisfactory to them, their team cohesion increases. Although the team cohesion of the players varies during the season, the cohesion levels are related to team satisfaction and group goals.

Shoenfelt (2011) suggested five steps to set the team goal:

- Defining team goals
- Determining the potential values of the team
- Discussing how team values affect team goals
- Reaching consensus on the five/seven most important values
- Prioritizing the values of the team

Two of the suggestions offered to coaches and leaders to improve team cohesion (Weinberg and Gould, 2010): (i) explain individual roles for team success and (ii) set challenging group goals.

Coaches should clearly explain players' roles and their importance to team members and give them opportunities to contribute. When they understand what is required of their teammates, they can start supporting and empathizing to them. The coach can support this environment by having players observe and record the efforts of their team members in different positions. Setting specific, challenging goals has a positive contribution on individual and group performance. Goals establish a high norm for efficiency and help the team focused on what it needs to achieve. Players should be congratulated for their achievements and encouraged to strive toward new goals. These goals must be clearly defined in order to enhance group cohesion. The goals should be performance goals rather than outcome goals.

2.2.2. Goal setting theory

Researchers (Weinberg and Gould, 2010) explain that goal setting works for two reasons: indirect thought process view and direct mechanistic view.

The indirect thought process view states that behavior is indirectly affected by the outcome, performance and process goals on important psychological factors such as self-confidence and anxiety. In other words, goals indirectly affect performance by affecting the psychological state. In addition, it is stated that creating an environment that emphasizes the self-reference process and performance goals helps individuals cope better with failure.

The direct mechanical view states that goals directly affect performance in four ways:

- Goals draw attention to important elements of performance.
- Goals activate the athlete's efforts.
- Goals prolong the athlete's determination.
- Goals encourage the development of new learning strategies.

For example, the process goal draws a basketball player's attention to an important element that he would not normally notice, such as the movement of the ball. In this

way, the basketball player moves in a certain direction with a certain intensity within the scope of this goal. This goal activates the effort and determination of the athlete. Finally, the set goal encourages the basketball player to develop new learning strategies.

2.2.2.1. Benefits of goal setting

Single-subject design study (Swain and Jones, 1995) that examine the effects of a goal-setting intervention program on selected components (e.g., turnovers, rebounds) of basketball performance followed a goal-setting program was designed based on the goal attainment scaling procedure. In the study, while there were no performance changes for all subjects in the components that weren't set by the subjects; there was consistent progress in their target zone for 3 of the 4 subjects' performance.

A goal setting meta-analysis (Kyllo and Landers, 1995) for the sport and exercise psychology literature found that goal setting is effective technique in changing behavior in a positive way. The benefits of goal setting are as follows (Burton and Raedeke, 2008):

- Goals encourage motivation, self-assurance, and efficient performance.
- Goals provide a positive and cohesive team climate.
- Goals improve focus and concentration.
- Goals increase self-confidence.
- Goals help reduce or avoid stress.
- Goals help foster a positive mental attitude.
- Goals boost intrinsic motivation to excel.
- Goals increase the quality of practices by making training more challenging.
- Goals improve playing skill, techniques, and strategies.
- Goals boost overall performance.

2.2.2.2. Effective goal setting and principles of goal setting

Research and practices identified a number of goal-setting principles. The effect of goal-setting tenets depends on the interaction between individuals and situations in which individuals are involved (team-individual sports/elite-amateur athletes, etc.). The followings may guide to design a goal-setting program (Weinberg and Gould, 2010):

- Set specific goals.

- Set moderately difficult and realistic goals.
- Set long-term and short-term goals.
- Set three types of goals (performance, process, and outcome).
- Set goals for practice and competition.
- Record the goals.
- Create goal achievement tactics.
- Consider the personality and motivation of the individual.
- Encourage a person's goal commitment.
- Provide goal support.
- Provide evaluation and feedback for goals.

For developing a team goal-setting program, Widmeyer and Ducharme (1997) offered:

- Establish long-term, specific, and challenging goals first.
- By using short-term goals, create clear paths to long-term objectives.
- Involve all members of the team in the goal-setting process.
- Monitor the team's progress toward team's goals.
- Reward team progress toward shared team goals.
- Encourage collective effectiveness in achieving team goals.

Researchers on goal setting (Burton and Raedeke, 2008; Weinberg and Gould, 2010) state that the followings as factors that increase the effectiveness of goal setting in sports and exercise environments (Table 2.1):

Table 2.1. *Factors that increase the effectiveness of goal setting in sports and exercise environments*

Burton and Raedeke (2008)	Weinberg and Gould (2010)
Emphasize process and performance goals more priority than outcome goals.	Employ different type of goals.
Instead of general or "do-your-best" goals, set specific, measurable goals.	Specificity of goals.
Set moderately difficult, challenging, and realistic goals.	Goals of moderate difficulty.
Set positively focused goals.	Public announcement of goals.
Set both long-term and short-term goals, and let short-term goals serve for achieving long-term goals.	Both short and long-term goals.
Set both individual and team goals, and let individual goals serve as the role-specific to attain team goals.	Self-determination in the goal-setting process.
Set both practice and competitive goals, as practice goals emphasizing skill development and competitive goals emphasizing performing optimally.	Commitment to goal attainment.
	Feedback on progress toward goal achievement.

2.2.2.3. Design of a goal setting system

A goal-setting system should be planned and developed from the 11 goal-setting principles is written above (Weinberg and Gould, 2010). Most goal-setting systems has three stages (i) preparation and planning, (ii) education and acquisition, and (iii) implementation and follow-up.

Preparation and planning stage includes four steps: (i) assess abilities and needs, (ii) set goals in diverse areas, (iii) identify influences on goal-setting systems, and (iv) plan goal achievement strategies.

Education and acquisition stage includes two steps: (i) schedule meetings and (ii) focus on one goal at a time.

Implementation and goal follow-up and evaluation stage includes three steps: identify appropriate goal evaluation procedures, (ii) provide support and encouragement, (iii) plan for goal reevaluation.

A number of problems can arise when resorting to goal setting according to the literature (Weinberg and Gould, 2010). Convincing students, athletes, and exercisers to set goals; failing to set specific goals; setting too many goals too soon; failing to adjust goals when they are not being met; failing to set performance and process goals; and failing to initiate goal-setting evaluation and follow-up procedures are just a few examples of common issues. Therefore, one should be aware of these problems and design a goal setting system to minimize their effects.

There are some suggested acronyms to help athletes and exercisers remind the characteristics of effective goals (Karageorghis and Terry, 2011; H. W. Smith, 1994; Weinberg and Gould, 2010; Whitmore, 2017).

SCAMP acronym is one of the suggested one to help remind the characteristics of effective goals (Karageorghis and Terry, 2011).

S: Specific: Goals should specify how far you want to go and how you will measure it.

C: Challenging and Controllable: Goals should stay in the realm of possibility and be challenging.

A: Attainable: Goals should include current status and step-by-step improvement.

M: Measurable and Multiple: Goals should be objectively measurable. Multiple goals will increase the probability of success. Each training unit should contain small goals that will contribute to the final goals.

P: Personal and Progressive: Goals should relate to the individual personally.

SMARTS acronym is another one of the suggested to help athletes and exercisers remind the characteristics of effective goals (H. W. Smith, 1994; Weinberg and Gould, 2010).

S: Specific: Goals should specify exactly what needs to be done.

M: Measurable: Goals should be measurable (quantifiable).

A: Action Oriented: Goals should specify what needs to be done.

R: Realistic: Goals should be achievable given the challenges.

T: Timely: Goals should be attainable within a reasonable time.

S: Self-determined: Goals must be determined by the participant/voluntarily.

These acronyms can also guide the goal-setting system design (Table 2.2).

Table 2.2. *Acronyms for goal-setting*

PURE	CLEAR	SCAMP	SMART	SMARTS
P: Positively stated	C: Challenging	S: Specific	S: Specific	S: Specific
U: Understood	L: Legal	C: Challenging & Controllable	M: Measurable	M: Measurable
R: Relevant	E: Environmentally Sound	A: Attainable	A: Action Oriented	A: Action Oriented
E: Ethical	A: Appropriate	M: Measurable & Multiple	R: Realistic	R: Realistic
	R: Recorded	P: Personal & Progressive	T: Time framed	T: Timely
				S: Self-determined

2.3. Feedback, Reinforcement, and Intrinsic Motivation

People wants professionals to foster pleasure, growth, and mastery using motivational techniques based on the principles of reinforcement. One of the most extensively studied and widely acknowledged concepts in psychology is reinforcement. Reinforcement is the employment of rewards and punishments to increase or decrease the likelihood that a similar response will occur in the future. They have a strong

foundation in the operant conditioning and behavior modification theories (Weinberg and Gould, 2010).

Feedback and intrinsic motivation include how the positive and negative information provided by individuals, which are important in an individual's life, affect perceived competence and intrinsic motivation (Weinberg and Gould, 2010).

Feedback is information that informs performers on how successfully they perform a task or progress according to a goal (Ashford and Tsui, 1991). It means, feedback helps performers to decide if more effort or a different strategy is needed to attain their goals. Moreover, if the feedback does not contain or ignored in goal setting, performance does not improve (Locke and Latham, 2013).

Vallerand (1983) found that the groups who received feedback had higher perceived competence and intrinsic motivation than those who did not and there were no differences among the feedback groups. Vallerand and Reid (1984) demonstrated that compared to negative or no input, positive feedback resulted in higher levels of intrinsic motivation in their study. Another study (Mouratidis et al., 2008) found that receiving very positive feedback (you're among the top in the class) as opposed to mildly positive feedback (you're around average) resulted in much higher levels of intrinsic motivation and future intention to engage in similar activities. These results show the importance of feedback for intrinsic motivation, especially positive feedback.

Intrinsic motivation can also be affected by success and failure in competition (Weinberg and Gould, 2010). Vansteenkiste and Deci (2003) studied the effect of positive performance-based feedback on winning and losing. The findings show that although losing is associated with decreased intrinsic motivation, the feedback provided to meet a certain standard (performance-positive feedback) has a significant contribution to reducing the detrimental effect of losing on intrinsic motivation. The study shows that focusing on performance goals helps maintain motivation rather than focusing on outcome goals. Individuals who perceive their performance as high have a higher level of intrinsic motivation than individuals who have lower perceptions of success (McAuley and Tammen, 1989). Winning and losing as outcome feedbacks are less important in regulating intrinsic motivation than subjective perception of how they performed. The adage "It's not whether you win or lose, but how you play the game"

helps to clarify how performance affects intrinsic motivation. Athletes or teams may lose against a superior opponent, despite the perception that they are performing better in competitions. Or, in the opposite scenario, they can win against a weak opponent even though the perception that they are performing worse. In other words, the focus of athlete or team performance seems to be more important than the outcome. These outcomes, which are considered subjective outcomes can be transformed into objective outcomes with using match statistics for the intrinsic motivation of the athletes.

Researchers (Weinberg and Gould, 2010) state the following suggestions for increasing intrinsic motivation and perception of competence:

- Provide successful experiences.
- Give rewards based on performance.
- Use both verbal and nonverbal praise.
- Vary sequence and content of practice drills.
- Include participants in decision-making.
- Set realistic performance goals.

2.3.1. Performance feedback and evaluation of goal attainment

There has been an increase in interest in performance feedback as a technique for enhancing performance in business, industry, and sport. It was found that performance increased by an average of 53% after the implementation of performance feedback and indicators of performance excellence (Kazak, 2015).

Performance feedback has some benefits like to motivate, to instruct, and to establishing goal-setting programs (Weinberg and Gould, 2010). Because effective goals are specific and measurable; clear, objective knowledge of results is essential to productive goal setting.

Many authors (Burton and Raedeke, 2008; Locke and Latham, 2013; Weinberg and Gould, 2010; Widmeyer and Ducharme, 1997) recommend using many types of goals for effective goal setting, along with the feedback and evaluation of goals. Furthermore, a second moderator of the goal-performance is feedback or knowledge of results since goals regulate performance much more effectively in the presence of feedback than in the absence of it (Locke and Latham, 2013).

Feedback related to achieving goals requires the evaluation of an athlete's performance. Feedback effectiveness can be maximized by using logs (regular performance results) to track athletes' progress toward achieving their goals (Table 2.3) (Burton and Raedeke, 2008).

Table 2.3. *A logbook* to track athletes' progress toward their goals*

Goal Setting	Week of**								
Goals	Current level (%)	Goal level (%)	M	T	W	Th	F	Game	Performance Average
1.									
2.									
3.									

* It is adapted from "Sport Psychology for Coaches" (Burton and Raedeke, 2008)

**M: Monday, T: Tuesday, W: Wednesday, Th: Thursday, F: Friday

There is an example below for performance analysis on setting goals (Table 2.4). After determining the performance, it is suggested to set multiple, challenging, and realistic goals and decide how much you want to improve each one and by when (Karageorghis and Terry, 2011). For example, if the free throw percentage of a guard is eighty percent, the guard may set a 90 percent goal for this performance.

Table 2.4. *Performance analysis score sheet**

Name: Arhan Taşcıoğlu Age: 15 Sport: Basketball Position: Guard			
Skills	Tests	Time/score	Goals for next game
Dribbling	On-court dribble slalom	46.2 s	45
Passing	Percentage that are successful	85%	90%
Rebounding	Percentage taken	50%	60%
Free throws	Percentage converted	80%	90%
Layups	Percentage converted	70%	80%
Defending	Number of steals per game	4	5

* It is adapted from "Inside Sport Psychology" (Karageorghis and Terry, 2011)

Goal evaluation may be the most important element in the goal-setting process (Locke and Latham 1990). Because feedback gives athletes information about their performance. A study suggested that to feedback and encourage frequent evaluation of progress toward their goals for keeping athletes' confidence and motivation high (Burton et al., 1998). If athletes' performance equal their goals or exceed them, their self-confidence and intrinsic motivation increase. If not, they will be motivated to work even harder to reach their goals. Furthermore, evaluation can guide the coaches and their athletes about how to adjust their individual and team goals. If their performance is

very close to their goals, they will be pleasure to keep the same goal level and enhance their effort to reach them. If their performance is not very close to their goals, they will know to adjust it to new goal level to avoid discouragement (Burton and Raedeke, 2008).

The other important issue regarding the use of goals and feedback together is rewarding athletes or teams who reach their goals in order to reinforcing the goal achievement. Reinforcing goal achievement support athletes to keep that behavior (R. E. Smith, 2021).

2.3.2. Developing effective behavioral programs

In a chapter (Kazak, 2015), some behavioral programs in many sports are given as an example. In one of them, a behavioral program for basketball aimed both performance and nonperformance behaviors. Coach set rewards and punishments for some behaviors like jump shooting, free-throw drills, layups, and for being a team player for his basketball players to act like team players in this program. While the basketball players behaved the desired behaviors, their scores increased. On the contrary, their scores decreased when they behaved undesirable behaviors. In addition, an “Eagle effort board” was posted in a highly visible place in the basketball arena, and leading athletes received an “Eagle effort” award at the end of the season. The program reached some outstanding results: jump shooting increased from 37% to 51%; layups increased from 68% to 80%, and foul shooting improved from 59% to 67%. Ten to 12 instances of encouragement before the program, increased 80%. Encouragement data, which was 10 to 12 number of frequency before the program, increased by 80% after the program. The coach commented after the program at the end of the season: “We were more together than I ever could have imagined.”

The following guidelines (Weinberg and Gould, 2010) can increase the effectiveness of behavioral intervention programs:

- Goal the behaviors
- Define behaviors which are goals
- Record the behaviors
- Declare the outcomes clearly
- Adapt the reward system

2.3.3. Cognitive evaluation theory

Cognitive evaluation theory (CET) is a subtheory of the self-determination theory (SDT) (Deci and Ryan, 1985). SDT covers three basic psychological needs: autonomy (individuals are motivated by personal initiative), relatedness (being in relationship with other people), and the needs for effectance (being an effective function in this environment). Therefore, cognitive development, intrinsic motivation, and performance can be maximized within social environments that provide these three basic needs to people.

The CET was developed to explain the variability in intrinsic motivation. The CET assumes that factors (reward distribution, feedback, reinforcement, and conditions) that affect people's perception of efficacy and sense of self-determination will also affect their intrinsic motivation. These factors have two components, controlling aspect and informational aspect. Both the controlling aspect and the informative aspect can increase or decrease intrinsic motivation depending on how it affects competence and self-determination (Weinberg and Gould, 2010).

2.4. Social Comparison Theory

This theory emphasizes that individuals evaluate and describe their performance by comparing it with the performance of others. In other words, individuals make decisions about themselves by comparing their own ideas or performances with those of others in order to reduce the uncertainty in their minds. Although the tendency to compare among individuals differs from one person to another, comparison can be seen as an inevitable element of social interaction (Festinger, 1954). For example, as a result of this comparison, if the athletes realize that their performance does not meet the expectations or is not as good as the performance of their peers, they will make more efforts to improve their performance.

Festinger (1954), used nine hypotheses to frame social comparison theory:

1. Humans have the drive to evaluate their opinions and abilities.
2. If there are no objective and non-social means, performers evaluate their opinions and abilities by comparing them to others.
3. The tendency to compare oneself to other specific performers decreases if the gap between their opinions and abilities increases.

4. There is a one-way upward drive when it comes to abilities that are largely absent in opinions.
5. While there are non-social restraints that make it difficult or even impossible to change performers' abilities; these restraints often do not have the same effect on opinions.
6. The fact that performers stop comparing themselves to others is accompanied by an unpleasant degree of hostility or humiliation felt during the comparison process.
7. Any factor that increases the importance of a particular group as a comparison group for a particular opinion or ability will increase the pressure for uniformity within that group on that ability or opinion.
8. The tendency to narrow the range of comparability becomes stronger if performers who are very different from one's own opinion or ability are perceived to differ from oneself on attributes consistent with that deviation.
9. If there are performers who have different opinions or abilities in the group, the pressure to compare will have different effects on those who are close to the group's style than those who do not.

According to Festinger (Festinger, 1954), an incorrect evaluation of abilities can cause negative consequences for the performer. The theory emphasizes that performers make use of three different comparison strategies when making comparisons in order to avoid this negative consequences. These can be listed as horizontal, upward and downward social comparisons. The first highlighted comparison in theory is the horizontal comparison. It states that performers compare themselves with their peers. The other highlighted up and down social comparisons state that performers compare themselves with better or worse ones.

In addition, it was stated that visualizing the class performance of a group of students in terms of certain performance indicators can increase the awareness of the students in that group about their performance, make inferences about their performance through comparisons (especially in male ones), and increase their education process commitment (Brusilovsky et al., 2016).

2.5. Games, Gamification, and Fogg Behavior Model

Although expressed with the same word in Turkish, play and game have different meanings. The concept of the game is suitable for the nature of basketball. A game is a structured kind of play that is typically done for entertainment or fun, though it can also be used as an educational tool (http-9).

Gamification is the use of game-design features and gaming principles in situations that are not game-related. It can also be described as a set of activities and processes for resolving problems by utilizing or putting to use game mechanics (http-10). Gamification is the process of employing game dynamics and game thinking to solve problems and engage audiences (http-11).

Games and game components are used in many disciplines to educate, entertain, and engage today. Some classic game elements are; points, badges, and leaderboards. Points are the most commonly used game mechanic as visual identifiers in reward cards and video games, especially in sports. Badges are a visual design that symbolizes success when a performance achieving or a task completing. The leaderboard, like points, is one of the game mechanics used to increase competition in many groups, especially in sports (Yilmaz, 2015). Gamification components were used in sports even before the concept of gamification became so widespread today. For example, social reinforcers (praise, smile, etc.) material reinforcers (trophies, medals, badges, etc.) activity reinforcers (playing a game rather than drilling, etc.), and special outings (throwing a team party, etc.) are used as effective reinforcers in sports (Weinberg and Gould, 2010).

The employee of the month is one of the first examples of leaderboards. The employee of the month consists of rewards and leaderboards. Many leaderboards can be designed. Favorites are leaderboards among friends, leaderboards with all users, weekly leaderboards, and monthly leaderboards. (Yilmaz, 2015). These correspond to the team leaderboards, match leaderboards, season leaderboards, and league leaderboards in basketball.

The two theories highlighted for understanding games and gamification are game theory and the Fogg behavior model. Although game theory is not directly related to games and gamification; it is useful in terms of understanding the achievements and

duties of the players in game design. The game theory developed by John Nash states that each member of a group must do their best for their own success in order for the group to perform at its best (Yilmaz, 2015).

The Fogg behavior model describes what causes behavior change. It has three components. These are motivation, ability, and prompt (feedback). These three components must work as one process. First, the player is motivated. Then the player takes action because of a trigger with this motivation. In the end, the player takes action immediately by taking feedback and is motivated again. According to the model, this cycle should be repeated in order (Fogg, 2021).

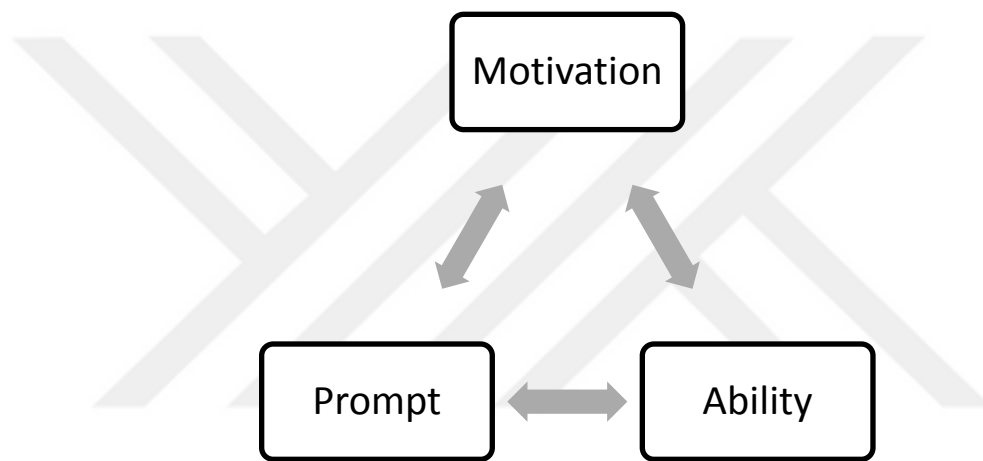


Figure 2.1. *Fogg Behavior Model*

The theory suggests checking three elements when gamification design is not working. If one of the three theoretical components is missing as a result of the control, behavior triggers can be used. Behavior triggers: spark, signal, and facilitator. Sparks are prompts that help individuals that have higher levels of ability, but lower levels of motivation. Facilitators are prompts that help individuals that have higher levels of motivation, but lower levels of ability. The signal is the trigger that helps individuals when they have both motivation and ability (Fogg, 2021).

2.6. Statistics, Efficiency and Positions in Basketball

In basketball, basketball-specific behaviors in the match are used to measure and follow the performance of the players on the field. To report performance, these stats are shown as totals, as per game, and as percentages both players and teams in the TBF

web site (<http-4>). The definition and abbreviations of statistics used by TBF are as follows (L. Martin, 2016; TBF, 2017) (Table 2.5).

Table 2.5. *Definitions and abbreviations of basketball statistics*

Match (M)	The total number of matches played by the player. It also could be used for the teams.
Win (W)	The total number of matches win by the team.
Lose (L)	The total number of matches lost by the team.
Time (T)	The total time the player has played.
Time per game (TPG)	The average of playing time by the number of games played by a player.
Points (P)	A point is scored if a live ball enters the basket from the top, stays in it, or goes all the way through the basket. The total points the player has made.
Points per game (PPG)	The average of points by the number of games played by a player.
Field goals made (FGM)	It is the sum of the scores made from the two-point field and from the three-point field.
Field goals attempt (FGA)	It is the sum of the attempts made from the two-point field and from the three-point field.
Field goals per game (FGPG)	The average of field goals by the number of games played by a player.
Field goals percentage (FG%)	The proportion of field goals made to those that were attempted.
2 point field goals made (2P)	It is the sum of the scores made from the two-point field.
2 point field goals attempt (2PA)	It is the sum of the attempts made from the two-point field.
2 point field goals per game (2PPG)	The average of two-point field goals by the number of games played by a player.
2 point field goals percentage (2P%)	The proportion of two-point field goals made to those that were attempted.
3 point field goals made (3P)	It is the sum of the scores made from the three-point field.
3 point field goals attempt (3PA)	It is the sum of the attempts made from the three-point field.
3 point field goals per game (3PPG)	The average of three-point field goals by the number of games played by a player.
3 point field goals percentage (3P%)	The proportion of three-point field goals made to those that were attempted.

Free throw made (FTM)	A one-point successful shot from behind the free-throw line, inside the semi-circle, without interference.
Free throw per game (FTPG)	The average of free throws by the number of games played by a player.
Free throw percentage (FTM%)	The proportion of successful free throws according to the total free throws by a player.
Rebound (RB)	Having a control on a missing shot by any player.
Rebound per game (RBPG)	The average of rebound by the number of games played by a player.
Offensive rebound (ORB)	A rebound taken by the attacking team to attack again after a failed attempt by the attacking team.
Offensive rebound per game (ORBPG)	The average of defensive rebounds by the number of games played by a player.
Defensive rebound (DRB)	A rebound taken by the defending team to start the offense after a failed attempt by the attacking team.
Defensive rebound per game (DRBPG)	The average of defensive rebounds by the number of games played by a player.
Steal (STL)	During the defense, it is to gain control of the ball by taking control of the ball from the attacking opponent.
Steal per game (STLPG)	The average of steals by the number of games played by a player.
Assist (AST)	It is the pass given before the field throw that results in a score. It is also known as the pass of the field throw made.
Assist per game (ASTPG)	The average of assists by the number of games played by a player.
Block (BLK)	It is the legal prevention between the ball and the basket by the defender of the offensive player's shot used to score.
Block per game (BLPG)	The average of blocks by the number of games played by a player.
Faul (F)	Violation of the rules regarding illegal personal contact with an opponent and/or unsportsmanlike conduct.
Faul per game (FPG)	The average of fouls by the number of games played by a player.
Turnover (TOV)	It is the loss of the ball during the attack and the control by the opponent.
Turnover per game (TOVPG)	The average of turnovers by the number of games played by a player.

In addition to these statistics, there are two more statistics, plus/minus point differential and the efficiency score. They are obtained by calculating with these statistics. Efficiency is one of the most commonly used statistical metrics for measuring players' total worth in professional basketball. The basic basketball statistics as points, rebounds, assists, steals, blocks, turnovers, and shot attempts are combined to create this

composite statistic. Theoretically, efficiency (player efficiency rating-PER) takes into account both a player's offensive (points and assists) and defensive (steals and blocks) contributions (http-12). In other words, the player efficiency scores aim to calculate a single score of all statistics of the players to be able to evaluate their performance. This single score aims to calculate all parameters in the court of the players to be able to evaluate their performance. A basketball team consists of five players whose roles are well-defined. These are point guard (PG- 5'7"- 7"), shooting guard (SG-5'10"-6'8"), small forward (SF-6'3"-6'10"), power forward (PF-6'5"-7'0"), and center (C-6'8"-7'3"). Players are tested in terms of physical, anthropological, and performance statistics in NBA draft according to these positions (L. Martin, 2016). Point guards are usually the shortest players on the team. While their main offensive duties are dribbling and passing the ball; their main defensive duties are to steal the ball. Shooting guards are also short heights compared to the other three player positions on the court. Having high field goals attempt is among their features. Small forwards are tall compared to point guards; while they are short compared to power forwards and centers. Their offensive features are dribbling, high field goals attempts, and offensive rebounds. On the other hand, their main defensive feature is defensive rebounds. The power forwards is shorter than the center but taller than the other three positions. Therefore, high rebound numbers and points are among their dominant features. Centers are the team's tallest players. Therefore, high two-point field goals and offensive rebound numbers are the main offensive features while they are under the rim. On the other hand, in defense, the blocks and defensive rebounds are among their main features. For example, the median ranking of performance statistics according to five positions in the NBA is as follows (L. Martin, 2016):

FG% = C > SF > SG > PF > PG
 AST = PG > SG > SF > PF > C
 STL = PG > SF > PF > SG > PG
 DRB = C > SF > PF > SG > PG
 ORB = C > PF > SF > SG > P
 PER = C > PG > SG > SF > PG

FG% = Field Goals Percentage
 AST = Assist
 STL = Steals
 DR = Defensive Rebounds
 OR = Offensive Rebounds
 PER = Player efficiency rating

2.7. WEB 2.0 Applications and Türkiye Digital Statistics

There are many classifications in the literature for WEB technologies. Although it is difficult to distinguish between these technologies chronologically; possible in terms of technological aspects. The most known classifications among them are WEB 1.0 and

WEB 2.0. WEB or WEB 1.0 refers to technologies where users can only access pre-created content (Filiz, 2018). Users are in a position to only consume the prepared content, but cannot change or even write comments. In other words, there is a one-way information sharing. WEB 2.0 refers to technologies that allow users to control their own data. WEB 2.0 tools are cost-effective, participatory, and scalable. Moreover, it utilizes collective intelligence (Solomon and Schrum, 2007). In other words, WEB 2.0 refers to technologies where users not only access pre-created content and also rebuilt it. It is also provided communication, interaction, sharing, and user-oriented features to the users.

UNESCO (UNESCO, 2007) lists WEB 2.0 applications among the fields of use of information and communication technologies in education. Within the framework of 21st century skills for new generations, The Ministry of National Education (MEB, 2017) renewed the education plan for new generations can solve complex problems, think critically, produce innovatively, communicate effectively, respect cultural differences, develop high-level cooperation, compete at the international level, and protect their own national self and consciousness. In a globalizing world, students need to acquire new skills. WEB 2.0 applications have great potential to organize both individual and collaborative learning activities with students and create new ways of interacting with students (Bennett et al., 2012). According to the "Digital 2023: Türkiye" report (Kemp, 2023), Türkiye's total population was 85.59 million ($Age_{median}=31.6$ years) in January 2023. While 49.9% of the population is female, 50.1% of the population is male. 7.5% of Türkiye's population is between the ages of 13 and 17. There are 81.68 million (95.4%) mobile users, 71.38 (83.4%) million internet users, and 62.55 (73.1%) active social media users. Compared to the previous year, the population increased by 0.6%, the number of mobile users increased by 3.2%, the number of internet users increased by 0.6%. The rate of individuals aged 16-64 who own a smart phone is 97.6%. They spend an average of 7.24 hours on the Internet, 4.26 hours on smartphones, and 2.54 hours on social media. 94.3% of them connect to the Internet using their smartphones. Türkiye's median mobile internet connection speed via cellular networks increased 3.1% between 2022 and 2023 and arrived at 31.93 Mbps. While the mobile Internet connection rate is 86.83% with Android operating system devices; it is 12.94% with iOS (iphone Operating System) operating system devices. The operating systems of other brands (Samsung OS, KAI OS, etc.) are below

1%. The number of mobile application downloads increased by 5.3% between 2022 and 2023, and reached 3.73 billion. The previous report (Kemp, 2022) showed that the above rates have increased each year. In addition, the main reasons for using the Internet and social media and types of social media accounts followed are given in Table 2.6.

Table 2.6. *Main reasons for using the Internet and the social media and types of social media accounts followed*

The Internet	The Social Media	Types of social media accounts followed
Finding Information (73.2%)	Reading news stories (51.0%)	Friends, family, and people you know (42.4%)
Keeping up-to-date with news and events (67.6%)	Keeping in touch with friends and family (50.1%)	Brands you purchase (35.2%)
Researching how to do things (63.9%)	Filling spare time (45.1%)	Brands you are considering purchasing (33.4%)
Researching products and brands (58.9%)	Finding products to purchase (33.0%)	TV shows or channels (27.7%)
Staying in touch with friends and family (58.3%)	Finding inspiration for things to do and buy (32.3%)	Entertainment, memes or parody accounts (24.3%)
Finding new ideas and inspiration (58.0%)	Finding content (e.g. videos) (30.9%)	Sports people and teams (23.6%)
Watching videos, television (TV) shows, and movies (53.7%)	Sharing and discussion opinions (29.5%)	Actors, comedians, or other performances (23.3%)
Accessing and listening to music (49.6%)	Seeing content from brands (27.9%)	Restaurants, chefs, or foodies (22.0%)
Education and study-related purposes (49.5%)	Watching live streams (26.9%)	Bands, singers, or musicians (21.0%)
Filling up spare time and general browsing (48.8%)	Watching or following sports (26.0%)	Journalists or news companies (20.2%)
Managing finances and savings (42.3%)	Seeing what's being talked about (24.9%)	Contacts relevant to work (18.7%)
Researching health issues and healthcare products (39.5%)	Posting about your life (24.7%)	Beauty experts (17.7%)
Business-related research (38.2%)	Work-related networking or research (24.3%)	Gaming experts or gaming studios (17.4%)
Researching places, vacations, and travel (38.0%)	Following celebrities and influencers (22.6%)	Companies relevant to work (17.3%)
Gaming (36.4%)	Making new contacts (22.4%)	Authors or literary groups (15.9%)

Chapter 2 presented the literature of this research and Chapter 3 presents the method of this research. Chapter 4 presents research findings, while Chapter 5 presents the sections of discussion, conclusion, and recommendations.

3. METHOD

This chapter presents the design-based research and includes (i) design-based research, (ii) participants and sampling methods, (iii) data collection, (iv) data analysis, (v) validity and reliability, (vi) methodological reflections, (vii) philosophical assumptions, (viii) role of the researcher, and (ix) ethical considerations.

3.1. Design-Based Research

Design-based research (DBR) is defined as a systematic but flexible methodology aimed to improve educational practices by iteratively analyzing, designing, developing, and implementing new ideas. DBR is based on collaboration among researchers and practitioners in real-world settings. It leads to contextually-sensitive design principles and theories at the end of the process (Wang and Hannafin, 2005). The design based research characteristics (Design-Based Research Collective, 2003; Richey, 2013; Wang and Hannafin, 2005) are given in Table 3.1.

Table 3.1. *Design-based research characteristics*

Design-Based Research Collective (2003)	Richey (2013; p. 79)	Wang and Hannafin (2005; p. 8)	This research
Contextually dependent interventions	Pragmatic epistemology focusing on real-world problems from the perspectives of all parts.	Contextual	Norms for productivity
Report outcomes with the development process and the real-world setting	Testing of the intervention in operating zones, online, or in other naturalistic contexts.	Grounded	Team development linear theory, goal setting theory, cognitive evaluation theory, intrinsic motivation, social comparison theory, Fogg behavior model.
Often conducted in a single environment over a long period of time	Use of multiple data collection methods.	Integrative	Quan and qual methods
Iterative cycles of design, enactment, analysis, and redesign	Active collaboration between the researcher(s) and stakeholder(s) in the design, construction, application, and assessment stages.	Interactive, iterative, and flexible	Researcher, players, coaches/experts, developers
Collaboration between researchers and stakeholders	Refinement and improvement of the intervention through multiple iterations.		
Lead the knowledge production that can help theoretical and practical for the designers	Development of theoretical understandings/principles that expand research's outcome beyond the locality.	Pragmatic	Theoretical and practical knowledge production

DBR allows using of multiple data collection methods. Both quantitative and qualitative data were used in this research. Greene, Caracelli, and Graham (1989) categorized five general purposes of mixed-methods research: (i) triangulation, (ii) complementarity, (iii) development, (iv) initiation, and (v) expansion. In this research, the aim of using quantitative and qualitative data is to provide complementarity, development, and triangulation.

This design-based research has three phases: planning the design, developing the design, and improving the design (Figure 3.1).

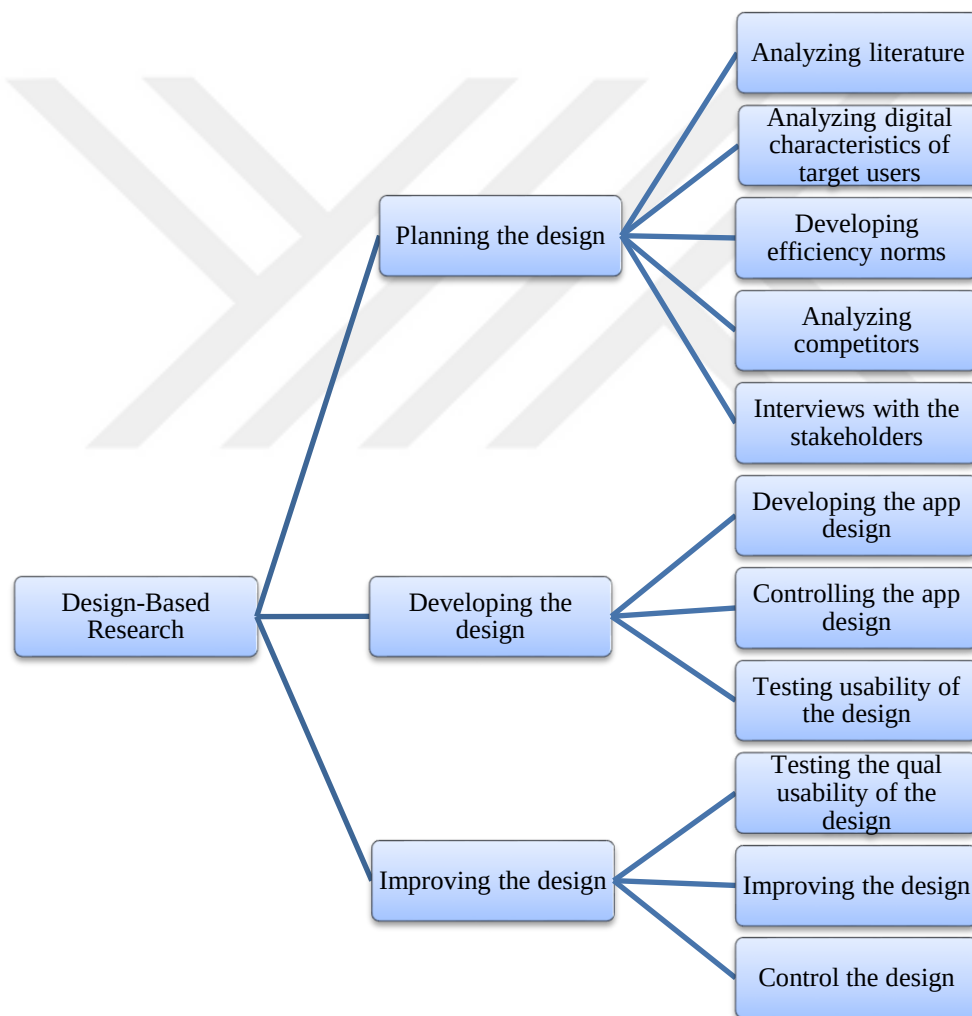


Figure 3.1. DBR design

Since the purpose of the research is to develop a mobile app specific to young basketball players, user-centered design (UCD) (Huang et al., 2019) was used in this design.

UCD is a concept that describes the design processes in which end users influence how a design will take shape. Four key activities for UCD:

- Understanding and specifying the context of use,
- Identify user and organization requirements,
- Generating design solutions, and
- Evaluate designs based on user requirements.

The principles of UCD:

- Design is based on a clear understanding of users, tasks, and environments,
- Users are included throughout the design and development,
- Design is guided and refined by user-centered evaluation, and
- The process is iterative.

The design addresses the entire user experience. There are many user experiences (UX) research methods in the literature. The frequently used qualitative UX research methods are stakeholder interviews, user interviews, focus groups, field studies/research visits, rapid corporate ethnography, contextual inquiry, and qualitative usability/user testing (Türk, 2023). Usability testing is the test that tells you whether the developed/to be developed product can be used or not by users (http-13). This test involves observing users as they use a website or a digital application. It is often used to uncover problems in app design, detect improvements, or uncover features that can be added (Cirucci and Pruchniewska, 2022). There are many types of usability tests in the literature (face-to-face/online; moderated/unmoderated; qual/quant) (Türk, 2023). The face-to-face and online moderated qualitative usability test was preferred in this research. The design team includes multidisciplinary skills and perspectives.

3.2. Participants and Sampling Methods

Due to the nature of design-based research, all stakeholders (designers, researchers, and target users) must take part in the process for significant change in practical situations. Therefore, during the design of the mobile application, the researcher collaborated with the players, logo designer, and software developer.

The universe of the research is the young male players of the Basketball Youth League. BYL has been organized by the Turkish Basketball Federation (TBF) since 2017 and ninety-nine teams competed in BYL throughout these five seasons.

In the quantitative part of the research, all players' data in the universe were used for the development of the norms.

In the qualitative analysis of the research, maximum variation sampling (Teddlie and Tashakkori, 2009) was used in order to maximize the range of perspectives of the players and obtain full players' diversity from each efficiency norm group. This sampling strategy involves purposefully selecting a wide range of cases in order to obtain an exact variation on the dimensions of interest and generate various comparisons (Teddlie and Tashakkori, 2009). So, the qualitative usability (user) testing were made with 5 players during the DBR stages (Türk, 2023).

Since the sample selected for the qualitative part of the research represents the subset of the sample in the quantitative part of the research, the sampling method of this mixed methods research is nested (Collins et al., 2007). The participants in the research are as follows according to the stages of DBR.

3.2.1. Participants of planning the design

A total of 1556 ($\bar{X}_{\text{Age}}: 17.73 \pm .89$) young male basketball players and ninety-nine teams that competed in BYL for five seasons (2017-2018, 2018-2019, 2019-2020, 2020-2021, and 2021-2022) were participants in the planning of the design.

Table 3.2. *Descriptive statistics of the players' age*

		n	Min	Max	$\bar{X}$	Sd
Seasons	2017-2018	300	16	19	17.77	.75
	2018-2019	303	15	19	17.67	.86
	2019-2020	311	16	19	17.61	.88
	2020-2021	304	16	20	17.77	.98
	2021-2022	338	16	20	17.83	.95
	Total	1556	15	20	17.73	.89

While Table 3.2 shows the descriptive statistics of the players' age; Table 3.3 shows the team names and the number of players in the teams according to the seasons.

Table 3.3. BYL teams by seasons

	2017-2018 (n=300)	2018-2019 (n=303)	2019-2020 (n=311)	2020-2021 (n=304)	2021-2022 (n=338)
1.	ANADOLU EFES (15)	ADATIP SAKARYA BÜYÜKŞEHİR BELEDİYE BASKETBOL (14)	AFYON BELEDİYESİ (15)	ALİAĞA PETKİM SPOR (13)	AFYON BELEDİYESİ (14)
2.	BAHÇEŞEHİR KOLEJİ (17)	AFYON BELEDİYESİSPOR (13)	ANADOLU EFES (16)	ANADOLU EFES (17)	ALİAĞA PETKİM SPOR (14)
3.	BANVİT (16)	ANADOLU EFES (17)	AREL ÜNİVERSİTESİ BÜYÜKÇEKMECE BASKETBOL (15)	BAHÇEŞEHİR KOLEJİ (17)	ANADOLU EFES (18)
4.	BEŞİKTAŞ (15)	AREL ÜNİVERSİTESİ BÜYÜKÇEKMECE BASKETBOL (14)	BAHÇEŞEHİR KOLEJİ (15)	BEŞİKTAŞ JK (19)	BAHÇEŞEHİR KOLEJİ (16)
5.	DARÜŞŞAFAKA BASKETBOL (14)	BAHÇEŞEHİR KOLEJİ (18)	BEŞİKTAŞ (17)	BÜYÜKÇEKMECE BASKETBOL (18)	BEŞİKTAŞ JK (20)
6.	DEMİR İNŞAAT BÜYÜKÇEKMECE BASKETBOL (18)	BANVİT BASKETBOL (18)	BURSASPOR (13)	DARÜŞŞAFAKA SPOR KUÜBÜ (14)	BÜYÜKÇEKMECE BASKETBOL (15)
7.	ESKİŞEHİR BASKET (12)	BEŞİKTAŞ (18)	DARÜŞŞAFAKA SPOR KULÜBÜ (15)	EMPARA HALI GAZİANTEP BASKETBOL (13)	DARÜŞŞAFAKA (20)
8.	FENERBAHÇE DOĞUŞ (16)	DARÜŞŞAFAKA BASKETBOL (17)	FENERBAHÇE BEKO (18)	FENERBAHÇE BEKO (13) FMV IŞIK OKULLARI AFYON	FENERBAHÇE BEKO (19) FMV IŞIK OKULLARI YALOVASPOR (16)
9.	GALATASARAY (17)	FENERBAHÇE BEKO (14)	FMV IŞIK BB (14)	BELEDİYESİ (14) FRUTTİ EXTRA BURSASPOR (12)	FRUTTİ EXTRA BURSASPOR (16)
10.	GAZİANTEP BASKETBOL (12)	GALATASARAY (18)	GALATASARAY (16)	GALATASARAY (16)	GALATASARAY NEF (20)
11.	GELİŞİM KOLEJİ (14)	GAZİANTEP BASKETBOL (14)	GAZİANTEP BASKETBOL (14)	GELİŞİM KOLEJİ (17)	GAZİANTEP BASKETBOL (16)
12.	İSTANBUL BBSK (17)	GELİŞİM KOLEJİ (14)	GELİŞİM KOLEJİ (16)	LOKMAN HEKİM FETHİYE BELEDİYE SPOR (17)	GELİŞİM KOLEJİ (14)
13.	MURATBEY UŞAK SPORTİF (13)	İSTANBUL BBSK (15)	OGM ORMANSPOR (16)	OGM ORMANSPOR (16)	PINAR KARŞIYAKA (18) PUSULAM KOLEJİ
14.	PINAR KARŞIYAKA (15)	PINAR KARŞIYAKA (17)	PINAR KARŞIYAKA (15)	PINAR KARŞIYAKA (13)	MERKEZEFENDİ BELEDİYESİ BASKET (17)
15.	SAKARYA BÜYÜKŞEHİR BASKETBOL (13)	SELÇUKLU BASKETBOL (16)	TAC NEF (17)	TARSUS AMERİKAN KOLEJİ (15)	TARSUS AMERİKAN KOLEJİ(14)
16.	TED ANKARA KOLEJLİLER (16)	TAC NEF (20)	TED ANKARA KOLEJLİLER (15)	TED ANKARA KOLEJLİLER (14)	TED ANKARA KOLEJLİLER (16)
17.	TOFAŞ (15)	TED ANKARA KOLEJLİLER (14)	TEKSÜT BANDIRMA BK (18)	TEŞVİKİYE (15)	TEŞVİKİYE (19)
18.	TRABZONSPOR (13)	TOFAŞ (16)	TEŞVİKİYE (14)	TOFAŞ (16)	TOFAŞ (21)
19.	TÜRK TELEKOM (15)	TÜRK TELEKOM (16)	TOFAŞ (17)	TÜRK TELEKOM (15)	TÜRK TELEKOM SPOR (15)
20.	YEŞİLGİRESUN BELEDİYESPOR (17)		TÜRK TELEKOM (17)		

In addition, the experts, the logo designer, and the software developer were other planning design participants.

3.2.2. Participants of developing the design

In developing the design stage, the developer played a significant participation and stakeholder role. The software developer's characteristics are given in Table 3.4.

Table 3.4. *Characteristics of the software developer*

Codes	Gender	Education Level	Expertise
D1	Male	M.Sc.	Full Stake Developer

3.2.3. Participants of improving the design

The participants of developing the design were determined by using the maximum variation sampling, which is a purposeful sampling method often used in qualitative research. Participants were selected by the productivity norms obtained as a result of the quantitative analysis. The participants of the qualitative analysis were selected from each group in the productivity norms. The participants' characteristics are given in Table 3.5. Players were selected from each season and from each position. Their ages ranged between 20 and 23 age ($\bar{X}_{Age}=21.40\pm1.52$).

Table 3.5. *Characteristics of the design improving phase participants*

Name	Season	Position	Age (years)	Seasons Norms	Age Norms
P1	2017-2018	Small Forward	23	Stars	Stars
	2018-2019			Stars	Stars
P2	2017-2018	Guard	23	Avarege Player	Avarege Player
P3	2019-2020	Power Forward	21	Stars	Stars
	2020-2021			All-Stars	All-Stars
P4	2021-2022	Center	20	MVP Candidates	MVP Candidates
	2022-2023			All-Stars	Stars
P5	2017-2018	Center	20	Stars	Stars

In addition, the developer was a main stakeholder in the improving design.

3.3. Data Collection

Multiple quantitative and qualitative data collection methods were utilized in the three stages of this DBR. The data collection of the research is as follows according to the stages of DBR.

3.3.1. Data collection of planning the design

The data collection process of the planning phase started with the analysis of the literature. Then, users' digital characteristics (Kemp, 2022) and basketball performance statistics were examined in order to be a user-centered process. Then, the data of all young male players of the Basketball Youth League (Basketbol Gençler Ligi) (BYL-

BGL) were collected for efficiency norm analyses. The players' data of the BYL was obtained at the end of the 2021-2022 season from the publicly announced statistics page of the official website (<http-4>) of the Turkish Basketball Federation. In addition to these steps, the characteristics of two basketball statistics platforms were collected. The data collection of this phase ended with the software developer and logo designer interviews.

3.3.2. Data collection of developing the design

The software developer explained the technologies used in the app development process in the meetings. All collection data were saved as a Word Document and presented.

3.3.3. Data collection of improving the design

Qualitative data were collected during the 2022-2023 season from the players selected according to maximum variation sampling as a result of quantitative analysis for developing the design. In other words, 5 players were selected with nested sampling, one of the mixed methods research sampling methods.

Qualitative usability tests were held with 5 players selected almost from each norm group after the researcher took the consent form (APPENDIX-4) for voluntary participation and explained the purpose of the study and told them they can express their opinions without hesitation. In addition, the participants were told that the interviews will be video and audio recorded via Zoom Platform and all records will also be watched and listened to for reliability purposes by another researcher. Recording the videos of the participants and their screen recordings while they use the application gave the researcher the opportunity to observe their behaviors and choices again. The participants were also informed that they might withdraw from the research at any moment and that during the data analysis, each participant would be assigned a code or nickname to ensure anonymity. All the participants gave their consent to participate in the qual user tests. The qual user tests were conducted online via the internet. The qual user tests lasted around 30 minutes on average. The transcripts of the records were 30 pages in MSWord Office Program.

At this phase, a qualitative usability test was developed for data collection with expert opinions. In the qualitative usability test development process, the planning phase of the design, user experience research literature, and think-aloud technique

literature was also utilized. This test was developed as a moderated test and included different question types (both quan and qual questions) (APPENDIX-5) and many tasks (APPENDIX-6). Furthermore, a pre-task (create account task) was added to the test to make the participants familiar with the test and the think-aloud technique. The think-aloud technique is a data collection technique used to explore the thought processes of individuals, to explain the reasoning of individuals completely and in detail during a problem-solving task, and to investigate the usability of systems (Çelik et al., 2023). The players were reminded to use the think-aloud technique between tasks because of the concurrent think-aloud type selected. Furthermore, other recommendations for the use of the think-aloud technique in a qualitative usability test (Çelik et al., 2023) were followed when data were collected.

3.4. Data Analysis

The subtitles include (i) data analysis of planning the design, (ii) data analysis of developing the design, and (iii) data analysis of improving the design.

3.4.1. Data analysis of planning the design

The planning phase data analysis includes the analysis of the literature, analysis of the users' digital characteristics, analysis of basketball performance statistics and norm development, competitor analysis, and analysis of stakeholders' interviews.

Although the literature review for the research continued from the beginning to the end of the research, the analysis of the theories and components to be used in the design of the application was completed at the planning stage. Then, the data of all young male players of the Basketball Youth League (Basketbol Gençler Ligi) (BYL-BGL) was analyzed for efficiency norm development process. Competitor (similar) apps that are commonly used in Türkiye by basketball players and coaches were examined in the competitor analysis. These were TBF website/app ([http-14](#)) and InStat Basketball Scout App ([http-15](#)). Quan content analysis (Bilgin, 2014) was used in the competitor app analysis.

Descriptive statistics (means ($\bar{X}$), standard deviations (sd), minimum, and maximum scores) were used for players' characteristics and players' statistics were calculated for the efficiency scores as a performance parameter. Since players' number

of matches varied, efficiency scores were standardized by dividing them by the number of matches.

Rankit Z-score method was used for developing the efficiency scores' norms by following the steps recommended by Erkuş and Selvi (2019). Ten steps are recommended both in the norm development process based on group values and in the rank-based norm development process:

1. Providing proofs of validity and reliability for the measurement tool,
2. Determination of a sample that reflects the infrastructure and influencing variables of the measurement tool and represents the universe,
3. Data collectors collect data within the framework of a certain standard and identify the variables that are likely to affect the data,
4. Careful processing of data, checking for missing data and extreme values and correcting if necessary,
5. Examining the raw score distributions separately according to the control variables, collecting data again if necessary,
6. Examining the control variables,
7. Finding the cumulative frequency of the raw scores for each level,
8. Regulating the distribution,
9. Converting the regulated data to percentile scores and/or standards, plotting the regulated score or the converted score graph to verify after conversion,
10. Comparative raw score-norm value tables are reported for each variable.

In the fourth step, all data were checked for outliers by converting the Z score which is a univariate outlier method (Akbaş and Koğar, 2020). After the converting, data outside the range of ± 3 were accepted as outliers and were not included in the process.

At the end of this method, both norms based on group values and norms based on ranking were developed. In addition, analysis of covariance (ANCOVA) and analysis of variances (ANOVA) was used to decide which variables (season and age) are significant to use in norm developing process. Assumptions of normality, homogeneity of variance, linearity, reliable measurement of the covariate, and homogeneity of regression were checked for ANCOVA (Pallant, 2011). Furthermore, the assumption that the covariate and the independent variable have a shared variance or not was checked with ANOVA (Can, 2016). Non-normal distribution data of efficiency score was transformed (by using square root technique) for parametric analysis (Pallant, 2011). Efficiency score variable was not homogenous for season and age comparison (Levene's test of homogeneity variances). There was no violation of the assumptions of linearity, homogeneity of regression slopes, and reliable measurement of the covariate for ANCOVA. Age (year) and playing time (sec-second) were candidates as covariates for efficiency scores. However, age was not used as a covariate in the season comparison, as it significantly differed between seasons. Playing time (sec) was used as a covariate for the seasons comparison. In the age group comparison, the playing time variable was a candidate as a covariate for efficiency scores. However, it was not used as a covariate, as it had a shared variance with the age group variable. As a result of this, it was excluded from the analysis, and ANOVA was used for the comparison. Assumptions of normality and homogeneity of variance were checked for ANOVA (Pallant, 2011). Non-normal distribution data of efficiency score was transformed (by using square root technique) for parametric analysis (Pallant, 2011). Efficiency score variable was not homogenous for age comparison (Levene's test of homogeneity variances). Tamhane was used for multiple comparisons between age groups. Cohen's (1988) effect sizes (ESs) and thresholds (.00, .06 and .14 as benchmarks for small, medium, and large effect sizes, respectively) were used to compare the magnitude of the differences in efficiency scores between season, age, and position groups. The partial eta squared value (Cohen, 1988) was used to determine how much of the variation in the players' efficiency scores could be explained. By multiplying the partial eta squared value by 100, it was converted to a percentage (Pallant, 2011).

Statistical Package for the Social Sciences (SPSS 25®) software was used for the statistical analysis, and a significance level of .05 and a 95% confidence interval (CI) were adopted for the analyses.

3.4.2. Data analysis of developing the design

In the design development phase, all the information from the developer was transferred to the computer in written format. Then, this information was presented in subtitles. In other words, in the development phase, the technologies used by the software developer were presented as main themes with their images.

3.4.3. Data analysis of improving the design

In the qualitative data analysis process, the raw (unprocessed) data of the developer were transferred to the computer in written format. Then, these recordings were transcribed and analyzed with Microsoft Word. Content analysis was used for the qualitative analysis in this research. Content analysis is the process of grouping similar data available in a data set according to certain concepts and themes and presenting the results to readers in a clear and understandable manner. Content analysis consists of the following phases: coding data, organizing codes and themes, and defining and interpreting findings (Yıldırım and Şimşek, 2011). The researcher followed these phases during the qualitative data analysis. Furthermore, the researcher observed the preferences and behaviors of the participants by watching their screen recordings of using the application. The qualitative usability test combined with survey questions allowed the collection of both quan and qual data types at the same time. Survey questions were comprised of 5 questions each of which is rated on a 5-point ranging from 1 to 5 (1=Very Poor; 2=Below Average; 3= Average; 4= Above Average; 5=Excellent). Therefore, descriptive statistics (means ($\bar{X}$), standard deviations (sd), minimum, and maximum scores) were also used in this phase for the players' app design opinions.

3.4.4. Mixed methods integrative analysis

Quantitative and qualitative results were combined to perform the mixed methods integrative analysis. In order to find an answer to the mixed method integration question of the research, the quantitative and qualitative findings used in the planning, development, and improvement phases of the design-based research method were included in the mixed method integrative analysis. In this research, a constant comparison technique was used to continuously compare the findings of the quantitative and qualitative analysis results. The constant comparison technique is a method used to make comparisons at all levels of the study by establishing analytical distinctions

(Charmaz, 2014). While the findings of the design planning phase were used for the design development phase; the findings of the design planning and design development phase were used for the design improvement phase. The findings of all phases were integrated through joint displays and narratives. While joint display refers to bringing data together with a visual tool to reveal new insights beyond the information obtained from quantitative and qualitative findings; the narrative is the thematic explanation of quantitative and qualitative findings (Fetters et al., 2013).

3.5. Validity and Reliability

Validity and reliability are explained as (i) quantitative analysis, (ii) qualitative analysis, and (iii) mixed methods integrative analysis.

3.5.1. Quantitative analysis

Ten stages recommended by Erkuş and Selvi (2019) were used in the norm development process. Norms' consistency were checked by the independent and volunteer coaches (C) and former players (FP) selected as an expert. The demographics of experts were given below in Table 3.6.

Table 3.6. *Demographics of the coaches and former players for norms' consistency process*

Codes	Gender	Education Level	Basketball Expertise	League	Season
C1	Male	Bachelor	E	BYL	2017-2018
C2	Male	M.Sc.	A	BYL	2017-2018
C3	Male	M.Sc.	B	U16 National Coach	2020-2021
C4	Male	Bachelor	C	BYL	2019-2020 2020-2021
C5	Male	Bachelor	D	BYL	2020-2021
C6	Male	Bachelor	C	BYL	2021-2022
C7	Male	Bachelor	C	BYL	2021-2022
C8	Male	Bachelor	A	BYL	2017-2018 2018-2019
C9	Male	Bachelor	C	BYL	2017-2018
C10	Male	Bachelor	B	BYL	2018-2019
FP1	Male	Bachelor	PG	BYL	2017-2018
FP2	Male	Bachelor	SF/PF	BYL	2017-2018 2018-2019
FP3	Male	Bachelor	PF/C	BYL	2019-2020
FP4	Male	Bachelor	PG/SG	BYL	2020-2021
FP5	Male	Bachelor	PF/C	BYL	2021-2022

Basketball coaching has five categories in Türkiye, namely E, D, C, B, and, A, respectively. Point Guard: PG, Shooting Guard: SG, Small Forward: SF, Power Forward: PF, Center: C

Ten coaches and five former players from each season of the league were contacted by phone regarding norms and performance consistency. Some of them shared their opinions on norms and performance consistency in writing via WhatsApp. When the coaches used the names of their players as an example of norm and performance consistency, the names of the players were written in code. Some of these opinions were given below:

C2: “MC and AA may be in the MVP (Most Valuable Player) norm. They were invited to the youth national team tryouts that season. GG could be an All-Star. He played a very good season. CS was an Average Player. Others are consistent.”

C6: “Age is an important factor for BGL. In terms of seasons, the norms are consistent with the players' performances. However, statistics are not enough for the defensive patterns of players. For example, OC, one of the players on our team, used to perform defense duties. He usually had the role of defending the opponent's top scorers and aimed them to achieve below their standard performances. Although I admit that OC is not in the all-stars norm with his performance, I think that his efficiency score means should be 6 or 7 (He emphasizes that the efficiency score does not adequately evaluate the defense.). But overall, the players' performances and norms are consistent.”

C7: “Your values (norm scores) are a clear shot (consistent) when I think of long-term training and match performances.”

C8: “Star groups are very large (The range of the Stars are very wide), there are players who should not be there when compared to others.”

FP1: “I'd say inconsistent for one out of twelve in our team. Overall, I think the performances of my teammates are consistent with the norms. When I think about my own performance, I didn't have enough playing time because I was a rookie. So, it's normal for my efficiency score to be low. In short, this norm group consists of my performance.”

FP2: “Overall, I think the norms are consistent with performances. Considering my own performance, I think it's normal for me to be in these norms for both seasons.”

FP3: “I think it does not reflect (it is not consistent), the scouting is necessary for example I was a man of duty (he means the need of observation of defense

responsibilities). Furthermore, I think the roles that coaches give to players are important for these statistical evaluation. Therefore, I think this kind of statistical evaluation is insufficient.”

FP4: Yes, it seems very realistic (He means that the norms and performances are consistent).

In one of the views, it was emphasized that the range of the Stars norm is wide. Stars norm is the group in the range of ± 1 according to their Z scores. The fact that this range in norm development was noticed by the experts shows that the experts whose opinions were taken made a detailed evaluation. This was noticed earlier in the research process, and percentiles were used for performance as well as developing norms based on Z scores.

In another view, it was emphasized that age was important for BGL. The opinion of this coach supported the significant difference found between age groups and necessity of developing norms for each age group.

Coaches and players who gave their views stated that the norms and performance were generally consistent. On the other hand, the comments written for inconsistency between the norms and performances draw attention to the fact that player statistics are insufficient in presenting the defensive performance instead of consistency between performances and norms. In other words, these opinions show that there were few opinions that express that norms do not reflect performances and these experts were aware of the nature of the basketball statistics.

3.5.2. Qualitative analysis

In this research, it is used credibility (in place of internal validity), transferability (in place of external validity), dependability (in place of reliability), and confirmability (in place of objectivity) for the validity and reliability processes of the qualitative analysis (Lincoln and Guba, 1985). The researcher had a proactive role in the entire research and followed many strategies (data, method, and researcher triangulation, expert opinion, rich descriptions) to meet these processes in the research. Furthermore, the researcher attended courses from both quantitative and qualitative research experts and took their feedback for the research process.

The qualitative usability test was developed with the opinions of experts (field experts, developer, supervisor, and dissertation committee members). The demographics of experts are below (Table 3.7). In the qualitative usability test development process, the planning phase of the design, user experience research literature, and think-aloud technique literature was also utilized. This test was developed as a moderated (both remote and face-to-face) test and included different question types (both quan and qual questions) and many tasks. Furthermore, a pre-task (create account task) was added to the test to familiarize the participants with the test and the think-aloud technique. The players were reminded to use the think-aloud technique between tasks. In addition, the data were transcribed immediately after the interviews. In other words, recommendations for the use of the think-aloud technique in a qualitative usability test (Çelik et al., 2023) were followed when data were collected. In addition, recording the videos of the participants and their screen recordings while they use the application gave the researcher the opportunity to observe their behaviors and choices again. Therefore, the test allowed the researcher to take more reliable data and to make data triangulation. These steps increased credibility (in place of internal validity), transferability (in place of external validity), and dependability (in place of reliability).

Table 3.7. *Demographics of the experts for qualitative usability test development process*

Codes	Gender	Education Level	Expertise
E1	Male	Ph.D	Sports Sciences
E2	Male	Ph.D	Distance Education
E3	Male	Ph.D	Distance Education
E4	Female	M.Sc.	Special Education
E5	Female	M.Sc.	Sports Sciences

In the data collection process, the participants' verbal consent was obtained with the interview transcripts. A volunteer researcher was asked to check both the audio and video records of the interviews for confirming the accuracy of the transcripts. During the coding phase, the researcher compared the qualitative results and determined the codes they agreed or disagreed with.

All statistics of the target population were used on norm development while maximum variation sampling was used for the interviews. Considering the quantitative and qualitative sampling methods used in the research, nested sampling was used as a

mixed research sampling method. These sampling methods increased the transferability (in place of external validity).

In the research, the characteristics of the participants and experts, the development process of the data collection tools, and the data analysis were presented with rich descriptions increasing the confirmability of the research.

3.5.3. Mixed methods integrative analysis

In this design-based research method, which adopts the mixed methods research methodology, paradigmatic mixing and commensurability (Onwuegbuzie and Johnson, 2006) were used for the validity and quality processes. While paradigmatic mixing is the successful combination or blending of quantitative and qualitative methods with epistemological, ontological, axiological, methodological, and rhetorical beliefs into a usable package; commensurability is the ability to make meta-inferences by constantly switching between quantitative and qualitative methods (Onwuegbuzie and Johnson, 2006).

As paradigmatic mixing, creating meta-inference was used for the integration of quantitative and qualitative analyzes carried out in the planning, development, and improvement phases of the design-based research methodology. During using the constant comparison technique, memoing assisted this process to reflect on the switches between paradigmatic assumptions when creating meta-inferences.

As commensurability, this research utilized fully integrated analyses that link, combine, and interrelate between the planning, development, and improvement phases.

The quantitative data supported with qualitative expert opinions and the qualitative usability test combined with survey questions enabled the collection of different data types at different stages of the research.

3.6. Methodological Reflections

The researcher intersected norm development research and user experience research with fully integrated analysis under the umbrella of design-based research methodology to develop a mobile app in three phases.

The above sentence, which is now written very easily, became clear at the end of the research. The researcher was very clear about a research method for this research at

the beginning of the research process. However, the researcher continued to read the literature after determining the research problem and unfortunately this clarity has disappeared. Although he was very confident at first, the wide scope of the research and the large number of research questions made it difficult for him to determine what the research method would be. To explain with a metaphor, the researcher's route was not clear, although very detailed roadmaps were available on the research methods. The researcher interviewed many experts to determine his route. He received feedback from some experts and the dissertation jury on transform the research questions. He clearly defined the research method with their support and supervision. At the end of this process, the researcher overcame the dilemma of design-based research and complex mixed methods research design for the method of the research.

The researcher explained the utilized complex theoretical and conceptual framework for the theory-based structure of DBR in the literature chapter. These were: (i) team development linear theory, (ii) goal setting theory, (iii) cognitive evaluation theory, (iv) social comparison theory, (v) Fogg behavior model and gamification, (vi) basketball statistics and efficiency, and (vii) WEB 2.0 applications.

In addition, the researcher, who received the support of many stakeholders (players, norms' consistency experts, logo designer, and developers, etc.) used both quantitative (norm development) and qualitative (user experiences tests, etc.) methods and data. In other words, the researcher utilized theory triangulation, method triangulation, and data triangulation together (Denzin, 2017), making use of various theories, methods, investigator, and data throughout this research.

3.7. Philosophical Assumptions

The researcher adopted pragmatism as a research paradigm to conduct this DBR. Johnson and Onwegbuzie (2004) describe pragmatism as a bridge between conflicting philosophies like constructivism and positivism. Methodologically, pragmatists believe that the current formulation of the research questions and the stage of the inductive-deductive research cycle should be taken into consideration when deciding whether to employ either (or both) methods. Epistemologically, there is no sharp contrast between objectivity and subjectivity for them. Axiologically, they are driven by value judgments that are important to them on what to study. Ontologically, on the one hand, while accepting the existence of external reality like positivists; on the other hand, they do not

ignore the variability of reality (Teddlie and Tashakkori, 2009). This is similar to Veysel's philosophy of likelihood (Sönmez, 2013). Because they can not determine whether a specific explanation is better than any other for desired outcomes (benefits) in different situations. They choose the option that increases the benefit according to the time and place of the situation.

3.8. Role of the Researcher

The researcher combined academician, entrepreneur, and basketball coach roles to conduct this research. All these roles influenced the research design and methods to execute it.

As an academician, the researcher has always been interested in research methodology. With this interest, he became a self-learner in quantitative, qualitative, and mixed-methods research. He took almost all the courses on research methodology at his university during his Ph.D with his “fear of missing out”. In addition, he followed the methodology courses of TÜBİTAK (Scientific and Technical Research Council of Türkiye) and other universities as well as the method courses of private institutions such as Academy of Research, Design, and Training (ARDAT) and Mersin Tourism Alumni Association (METIOD). In this process, he met with many methodologists such as Anthony J. Onwuegbuzie and Sinem Toraman Türk. This process enabled him to gain competence and confidence in the research methods used to solve the problem of this research.

Due to his entrepreneurial nature, he applied once to KOSGEB (Small and Medium Enterprises Development and Support Administration), twice to TÜBİTAK 1512 project, and once to Çankaya University BeeJet Programme. In this process, he gained the ability to write projects and establish and manage a company. This process showed him the importance of focusing on products and services that fit users' needs. The researcher reflected on his achievements in this research process on his ability to identify user-centered real-world research problems and form project teams. To carry out this research, he applied for a doctoral thesis project to Anadolu University Scientific Research Projects Coordination Unit and was accepted.

The researcher is a former basketball player who continued his interest in basketball and is a level 3 basketball coach now. He coached some basketball teams and

university teams. In this process, he observed that basketball was not managed data-based for various reasons. While the data was not saved in some cases, the saved data was not used in some cases. For example, the young players had difficulties using the data they had and could not make decisions based on the data. Therefore, in this research, he focused on the data based goal management problem in terms of user perspective because he believed that basketball players could overcome the difficulties they experience in setting performance goals with the help of data and technology.

All these personal and academic experiences with various roles such as an academician, entrepreneur, and basketball coach influenced his perspective on designing this research.

In this DBR process, the researcher had both objective and subjective roles (Yıldırım and Şimşek, 2011). While he had an objective role in the planning phase of the research, he had a subjective role in the development and improvement phases of the research. His objectivity is reflected on the efficiency norm development with the positivist paradigm. His subjectivity is reflected in the interpretation of the qual usability test results where he used inductive approach in the data analysis with constructivist paradigm. In other words, the researcher started the DBR process with the complete observer role and continued with the observer as a participant role. While the researcher was outside the observed environment during the planning phase, during the development and improvement phase the players knew very well why he was there and there was no need for the researcher to pretend to be part of the natural environment (Güler et al., 2013). In addition, the researcher thinks he not only shifted perspectives outside to inside or inside to outside but also lived the concept of "space between" as experiencing both insider and outsider positions through out all the research (Dwyer and Buckle, 2009).

Glesne (2016) reviewed researcher roles and ethical dilemmas in his book and suggested that researchers may have four roles. These are exploiter, intervener/reformer, advocate, and friend. Researcher thought on these roles in this research. Exploiter is used to refer to researchers who benefit greatly from participants' knowledge but give much less in return. At the end of the research, the researcher think the efficiency norms developed specifically for the participants and the user-centered mobile application show that the researcher does not have this role. Due to the nature of the research

problem, the researcher did not need the intervener/reformer role. Since he focused on the opinions and experiences of the players regarding the mobile app, he did not encounter any vital issues for the players and continued his research without having to interfere with these issues. The researcher thinks that the players have the role of advocate during their opinions and experiences. He had a dilemma about whether players understood the nature of player performance statistics correctly and their efficiency scores. He responded to these dilemmas with a more inclusive context by reflecting on this dilemma. Although the researcher is friends with some players before and during the research, he does not think that he has reached a finding to the detriment of the players he is friends with or the research during the research process. In other words, although the researcher gets help from the role of friend in his first contacts with some participants, he does not think that he is in the role of friend during the research process. His complete observer role and observer as a participant role above clarified his friend role.

3.9. Ethical Considerations

The researchers have various responsibilities towards his scientific community, the society, and the participants of his research (Gürbüz and Şahin, 2017). In this context, the researcher paid attention to the implementation of ethical values such as conscious consent, confidentiality, respect for private life and not harming, not cheating, and staying true to data, which are responsible from the beginning to the end of the research (Yıldırım and Şimşek, 2011).

In order to eliminate ethical concerns, participants were informed about the study both in voluntary participation forms and in interviews. After this information, the ethics committee permissions obtained for the research were shown to the participants. During the research, all participants were informed about voluntary participation and explained the purpose of the study and told them they can express their opinions without hesitation. In addition, the participants were told that the interviews will be video recorded and all records will also be listened to for reliability purposes by one expert and another researcher. The participants were also informed that they might withdraw from the research at any moment and that during the data analysis, each participant would be assigned a context-appropriate code or nickname to ensure anonymity. Qual data collection days were determined according to the participants, and

none of the participants saw each other in these environment or next to the researcher. In addition, qual data collection was not held in the training or game hours so that the players to stay anonymous.

The research followed the guidelines of the Declaration of Helsinki and was approved by the ethics committee of Anadolu University (No: 68215917-050.99) (APPENDIX-1 and APPENDIX-2). In addition, the Turkish Basketball Federation gave written consent for the research (No: 2019/0939) (APPENDIX-3).

Chapter 3 presented the method of this research. While Chapter 4 presents research findings, Chapter 5 presents the sections of discussion, conclusion, and recommendations.

4. FINDINGS

In this chapter, there are findings presented according to the phases of design-based research used in this research.

4.1. First Phase: Planning the Design

At this stage, the answers of the questions for needs analysis and norm development are presented. In this context, the literature was analyzed, both the digital characteristics and performance statistics of the players were examined, efficiency (productivity) norms were developed, and competitors were analyzed. At the end of this stage, all the data collected were shared with the stakeholders (software developer, logo designer, etc.) and decisions were made regarding the design.

4.1.1. Literature analysis

Design-based research is a grounded (theory-based) research method. Therefore, the first research question was: *What is the conceptual and theoretical framework needed to develop a mobile app?*

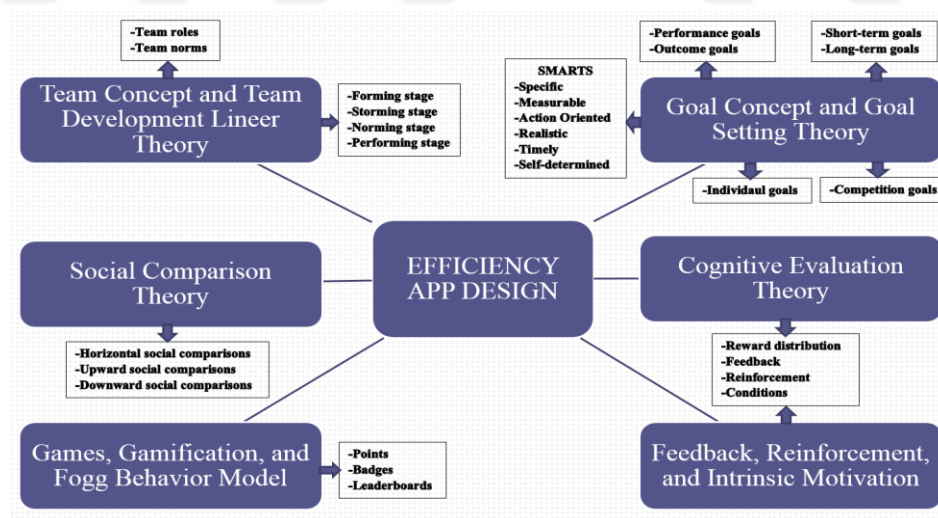


Figure 4.1. Mobile app theoretical design

The literature was reviewed to address this research question. In this context, it was used team development linear theory, goal setting theory, cognitive evaluation theory, social comparison theory, intrinsic motivation, Fogg behavior model, and efficiency in basketball for developing this app (Figure 4.1).

4.1.2. Digital characteristics of the target users

Design-based research is a context-focused research method. Therefore, the second research question was: *What are the digital characteristics of the mobile app target audience?* The document analysis was used to address this research question and “Digital 2023: Turkey” report (Kemp, 2023) was analyzed. According to the report, individuals between the ages of 16-64 prefer mobile technologies more and more each year when connecting to the Internet. The reasons for using the Internet and social media in the report were examined and those related to the research were in bold and underlined (Table 4.1).

Table 4.1. *Main reasons for using the Internet and the social media and types of social media accounts followed of target users*

The Internet	The Social Media	Types of social media accounts followed
<u>Finding information (73.2%)</u>	Reading news stories (51.0%)	<u>Friends, family, and people you know (42.4%)</u>
<u>Keeping up-to-date with news and events (67.6%)</u>	<u>Keeping in touch with friends and family (50.1%)</u>	Brands you purchase (35.2%)
Researching how to do things (63.9%)	Filling spare time (45.1%)	Brands you are considering purchasing (33.4%)
Researching products and brands (58.9%)	Finding products to purchase (33.0%)	TV shows or channels (27.7%)
<u>Staying in touch with friends and family (58.3%)</u>	Finding inspiration for things to do and buy (32.3%)	Entertainment, memes or parody accounts (24.3%)
Finding new ideas and inspiration (58.0%)	Finding content (e.g. videos) (30.9%)	<u>Sports people and teams (23.6%)</u>
Watching videos, TV shows, and movies (53.7%)	Sharing and discussion opinions (29.5%)	Actors, comedians, or other performances (23.3%)
Accessing and listening to music (49.6%)	Seeing content from brands (27.9%)	Restaurants, chefs, or foodies (22.0%)
<u>Education and study-related purposes (49.5%)</u>	Watching live streams (26.9%)	Bands, singers, or musicians (21.0%)
Filling up spare time and general browsing (48.8%)	<u>Watching or following sports (26.0%)</u>	Journalists or news companies (20.2%)
Managing finances and savings (42.3%)	Seeing what's being talked about (24.9%)	<u>Contacts relevant to work (18.7%)</u>
Researching health issues and healthcare products (39.5%)	<u>Posting about your life (24.7%)</u>	Beauty experts (17.7%)
Business-related research (38.2%)	<u>Work-related networking or research (24.3%)</u>	Gaming experts or gaming studios (17.4%)
Researching places, vacations, and travel (38.0%)	Following celebrities and influencers (22.6%)	Companies relevant to work (17.3%)
Gaming (36.4%)	Making new contacts (22.4%)	Authors or literary groups (15.9%)

Furthermore, according to the report, Türkiye's total population was 85.59 million (Age_{median}=31.6 years) in January 2023. While 49.9% of the population is female,

50.1% of the population is male. 7.5% of Türkiye's population is between the ages of 13 and 17. There are 81.68 million (95.4%) mobile users, 71.38 (83.4%) million internet users, and 62.55 (73.1%) active social media users. Compared to the previous year, the population increased by 0.6%, the number of mobile users increased by 3.2%, and the number of internet users increased by 0.6%. The rate of individuals aged 16-64 who own a smartphone is 97.6%. They spend an average of 7.24 hours on the Internet, 4.26 hours on smartphones, and 2.54 hours on social media. 94.3% of them connect to the Internet using their smartphones. Türkiye's median mobile internet connection speed via cellular networks increased by 3.1% between 2022 and 2023 and arrived at 31.93 Mbps. While the mobile Internet connection rate is 86.83% with Android operating system devices; it is 12.94% with iPhone Operating System (iOS) devices. The operating systems of other brands (Samsung OS, KAI OS, etc.) are below 1%. The number of mobile application downloads increased by 5.3% between 2022 and 2023 and reached 3.73 billion.

4.1.3. Efficiency norm development

Design-based research is a context-focused research method. Therefore, the third research question was: *What are the norms which are developed as goals for young players?* To address this research question, ten steps were followed both in the norm development process based on group values and in the rank-based norm development process (Erkuş and Selvi, 2019):

1. Providing proofs of validity and reliability for the measurement tool:

Basketball statisticians are trained theoretically and practically before they start collecting statistics. If they succeed, they are assigned to matches. Basketball player statistics are collected by two statisticians in each game. They use FIBA LIVE STATS by Genius Sports (<http://17>) that FIBA (Fédération Internationale de Basketball Association-The International Basketball Federation) use when they collect the data. They collect field goals, 2 points, 3 points, free throws, defensive rebounds, offensive rebounds, total rebounds, assists, turnovers, steal, blocks, personal fouls, and fouls drawn. After these statistics were collected and saved to the FIBA LIVE STATS, the app calculates the plus / minus and efficiency score with using these statistics. They share these data with teams and TBF. And then, TBF shares them from the publicly

announced statistics page of the official website. These statistics were collected by the researcher as secondary data from the TBF official web site for this research. In summary, statistics are collected by trained professionals as primary data in matches with the support of technology and published on the website. These published statistics were collected and analyzed as secondary data within the scope of this research. Conclusion, the data (efficiency score) used in this research was evaluated as reliable, useful, objective, and valid (content validity) as a measuring instrument.

2. Determination of a sample that reflects the infrastructure and influencing variables of the measurement tool and represents the universe:

The data used in the research includes all the variables that can reflect the infrastructure and influencing variables of the the efficiency score as measurement tool as well as players playing five seasons in this league from the beginning of this organization as research universe.

3. Data collectors collect data within the framework of a certain standard and identify the variables that are likely to affect the data:

Data collectors collected the data within the framework of a certain EXCEL file standard and identified the variables that are likely to affect the data. Since players' number of matches varied, efficiency scores were standardized by dividing them by the number of matches.

4. Careful processing of data, checking for missing data and extreme values and correcting if necessary:

The data was carefully processed. No missing data were found in the efficiency score data. And then, all data were checked for outliers by converting the Z score which is a univariate outlier method (Akbaş and Koğar, 2020). After the converting, data outside the range of ± 3 were accepted as outliers and were not included in the process.

5. Examining the raw score distributions separately according to the control variables, collecting data again if necessary:

Raw score distributions were analyzed separately according to the levels of control variables (Table 4.2).

Table 4.2. *Descriptive statistics of the players' efficiency according to the season and age*

		n	$\bar{X}$	SS	Min	Max
Seasons	2017-2018	300	6.14	5.21	-1.60	27.00
	2018-2019	303	5.69	5.10	-2.00	29.00
	2019-2020	311	6.43	5.93	-2.69	47.00
	2020-2021	304	5.80	5.50	-5.00	29.25
	2021-2022	338	5.79	5.28	-2.00	27.67
Ages	15	2	1.75	1.77	.50	3.00
	16	98	3.63	4.53	-2.00	29.00
	17	552	3.80	3.95	-5.00	26.66
	18	599	5.85	4.90	-3.00	47.00
	19	277	10.70	5.57	-4.00	23.80
	20	28	12.96	6.80	1.86	29.25

Since there is not enough number in some subgroups of the age variable, while 15 and 16 year old players were combined with 17 year old players; 20-year-old players were combined with 19-year-old players. Then analyzes were performed for control variables. After the re-coding, the number of 15/16/17-year-old players was 651. The number of 18-year-old players was 600. The number of 19/20-year-old players was 305.

6. Examining the control variables:

Seasons, age, and positions were checked as control variables. According to the results of the covariance analysis, when the seasons were controlled, there was a significant relationship between the players' efficiency score and minutes played. Meaning, players' efficiency ratings are affected by the minutes played of the players. After adjusting for minutes played of players, there was no significant difference between seasons ($F_{(4,1471)}=1.807$; $p=.125$; $\eta^2=.005$) (Table 4.3).

Table 4.3. *Covariance analysis for efficiency score by seasons*

Source	SS	df	MS	F	p	η^2
Minutes Played (Sec)	1186.862	1	1186.862	3332.852	.000	.694
Seasons	2.575	4	.644	1.807	.125	.005
Error	523.838	1471	.356			
Total	1717.946	1476				

Table 4.4 presents the results of adjusted efficiency ratings obtained by controlling minutes played and age of the players.

Table 4.4. Means and adjusted means of players' efficiency ratings for seasons

Seasons	n	$\bar{X}$	Adjusted $\bar{X}$	95% CI	F	p	η^2
2017-2018	287	2.30	2.25	2.18-2.32	1.807	.125	.005
2018-2019	291	2.21	2.24	2.17-2.31			
2019-2020	299	2.34	2.35	2.27-2.41			
2020-2021	271	2.35	2.31	2.24-2.38			
2021-2022	329	2.18	2.24	2.18-2.31			

According to the results of ANOVA, there was a significant difference between the ages of the players ($F_{(2,1553)}=235.834$; $p=.000$; $\eta^2=.221$). Tamhane multiple comparison tests showed that 19/20-year-old players were higher performance than 18-year-old players ($p=.000$) and 15/16/17-year-old players ($p=.000$). And it showed that 18-year-old players were higher performance than the 15/16/17-year-old players ($p=.000$) (Table 4.5).

Table 4.5. One-way analysis of variance for efficiency scores of players by age groups

Age Groups	n	$\bar{X}\pm sd$	95% CI	F	p	η^2	Tamhane
15/16/17	651	3.77 $\pm$ 4.04	3.46-4.08	235.834	.000	.221	19/20>18***
18	600	5.85 $\pm$ 4.90	5.45-6.24				19/20>15/16/17***
19/20	305	10.91 $\pm$ 5.72	10.27-11.56				18>15/16/17***

*** $p < .001$ ** $p < .01$ * $p < .05$ $p > .05$

7. Finding the cumulative frequency of the raw scores for each level,

8. Regulating the distribution,

9. Converting the regulated data to percentile scores and/or standards, plotting the regulated score or the converted score graph to verify after conversion:

Steps 7, 8, 9 were controlled and achieved by the Rankit Z score method.

10. Comparative raw score-norm value tables are reported for each variable:

Comparative raw score-norm value tables were reported according to the levels of each variable.

Since there was no difference between the seasons, a single norm and percentage table is reported for the seasons (Table 4.6).

The norms were named according to the achievements of the players as badges.

Table 4.6. Norms and percentages of efficiency scores for the seasons

Z Scores	Efficiency Score Range (n)	Badges	Percentage (%)	Efficiency Score Limits (n)	Badges
(-3)-(-2)	(-3.00)-(-.75) (33)	Rotation Players	1-10 11-20	(-3.00)-.5 (175) .53-1.42 (148)	
(-2)-(-1)	(-.67)-(1.00) (223)	Average Players	21-30 31-40	1.43-2.33 (156) 2.35-3.33 (153)	
(-1)-(+1)	1.04-11.24 (1044)	Stars	41-50 51-60	3.35-4.67 (155) 4.68-6.26 (153)	
(+1)-(+2)	11.25-18.36 (210)	All-Stars	61-70 71-80	6.26-8.17 (155) 8.18-10.32 (154)	National Player
(+2)-(+3)	18.43-21.38 (33)	MVP Candidates	81-90 91-99	10.34-13.79 (155) 13.84-21.38 (137)	Candidates

Three norms and percentage tables were reported, as there was a difference between age groups (Table 4.7, Table 4.8, and Table 4.9).

Table 4.7. Norms and percentages of efficiency scores for the 19/20 year old players

Z Scores	Efficiency Score Range (n)	Badges	Percentage (%)	Efficiency Score Limits (n)	Badges
(-3)-(-2)	(-4)-0.33 (7)	Rotation Players	1-10 11-20	(-4)-3.64 (33) 3.67-6.38 (31)	
(-2)-(-1)	.63-5.14 (41)	Average Players	21-30 31-40	6.58-7.80 (30) 7.88-9.13 (31)	
(-1)-(+1)	5.23-16.75 (208)	Stars	41-50 51-60	9.24-10.69 (30) 10.08-12.47 (30)	
(+1)-(+2)	16.8-21.07 (41)	All-Stars	61-70 71-80	12.47-14.06(31) 14.11-16.39 (30)	
(+2)-(+3)	21.38-27.66 (7)	MVP Candidates	81-90 91-99	18.96-16.40 (31) 19.09-27.66 (27)	

Table 4.7 shows the norms and percentages for players aged 19/20.

Table 4.8. Norms and percentages of efficiency scores for the 18 year old players

Z Scores	Efficiency Score Range (n)	Badges	Percentage (%)	Efficiency Score Limits (n)	Badges
(-3)-(-2)	(-.75)-(-2.69) (12)	Rotation Players	1-10 11-20	(-2.69)-(.65) (64) .67-1.69 (60)	
(-2)-(-1)	(-.50)-1.27 (82)	Average Players	21-30 31-40	1.70-2.78 (61) 2.80-3.75 (60)	
(-1)-(+1)	1.33-10.58 (408)	Stars	41-50 51-60	3.8-4.96 (59) 5.00-6.41 (60)	
(+1)-(+2)	10.61-16.31 (81)	All-Stars	61-70 71-80	6.42-8.08 (60) 8.15-9.67 (59)	
(+2)-(+3)	16.56-20.03(13)	MVP Candidates	81-90 91-99	9.69-12.56 (60) 12.59-20.03 (53)	

Table 4.8 shows the norms and percentages for players aged 18.

Table 4.9. Norms and percentages of efficiency scores for the 15/16/17 year old players

Z Scores	Efficiency Score Range (n)	Badges	Percentage (%)	Efficiency Score Limits (n)	Badges
(-3)-(-2)	(-2.00)-(-1.00) (17)	Rotation Players	1-10	(-2.00)-.00 (75)	
			11-20	.09-.82 (60)	
(-2)-(-1)	(-.75)-.50 (91)	Average Players	21-30	.83-1.39 (64)	
			31-40	1.40-2.1 (66)	
(-1)-(+1)	.53-7.06 (436)	Stars	41-50	2.11-2.74 (63)	
			51-60	2.75-3.50 (66)	
(+1)-(+2)	7.07-13.56 (88)	All-Stars	61-70	3.54-4.59 (65)	
			71-80	4.62-6.38 (65)	
(+2)-(+3)	13.67-21.08 (14)	MVP	81-90	6.42-9.00 (65)	
		Candidates	91-99	9.06-21.08 (57)	

Table 4.9 shows the norms and percentages for players aged 15/16/17.

4.1.4. Competitor analysis

Design-based research is a context-focused research method. Therefore, the fourth research question was: *What are the functions of similar apps to the mobile app?* To address this research question, websites were reviewed and quantitative content analysis is utilized. In other words, the most popular apps (TBF App and InStat Basketball Scout App) with similar functions in Türkiye were compared with competitor analysis at the planning stage in terms of general characteristics. TBF App is a mobile application developed by TBF that helps basketball fans will be able to instantly access all news, standings, live scores, statistics, statistic leaders, and fixtures published by TBF. The application, which is compatible with new-generation devices and can also be used horizontally, allows for more efficient data communication. TBF Mobile Application, which is user-friendly with its modernized interface, has a sustainable and developable structure. The application, which will also include the live score feature, can send instant notifications to users. The application is available from the App Store and Play Store (http-14; http-16). InStat Basketball Scout App is a customizable mobile application that helps athletes, coaches, scouts, video analysts, agents, managers, and other sports professionals to see the match statistics and to analyze the game and videos, and download and share episodes via email and messengers (http-15).

In competitor analysis, general features of the TBF App and TBF's BYL news (announcements) were analyzed. As a result of this analysis, it was found that TBF not only shares announcements in the news but also uses some gamification elements for

individuals and teams. Below are the tables showing the general trend for gamification components by the quan content analysis (Table 4.10 and Table 4.11):

Table 4.10. *BYL news types*

Seasons	News Types		Total
	News	Gamification	
2017-2018	66	26	92
2018-2019	49	46	95
2019-2020	44	24	68
2020-2021	35	5	40
2021-2022	72	4	76
Total	266	105	371

It was found that 266 news and 105 gamification components were shared (Table 4.10).

Table 4.11. *BYL gamification types*

Seasons	GamificationTypes		Total
	Player	Team	
2017-2018	21	5	26
2018-2019	41	5	46
2019-2020	20	4	24
2020-2021	2	3	5
2021-2022	0	4	4
Total	84	21	105

It was found that 84 gamification components were shared for the players and 21 gamification components were shared for the teams (Table 4.11).

Table 4.12 shows the general features of the TBF App and Instat Basketball Scout App.

Table 4.12. *Competitor analysis*

Apss/Features	TBF App	Instat Basketball Scout App	Stats&Goals
WEB 2.0	-	+	+
Repsonsive Design	+	+	+
Feedback (Notifications)	+	+	+
Goal setting	-	-	+
Social comparison	+	+	+
Gamification	+	-	+
Video analysis	-	+	-

4.1.5. Interviews with the stakeholders

Design-based research is an interactive research method. Therefore, the fifth research question was: *What are the developers' opinions on app design?* To address this research question, interviews were utilized with developers.

During the planning phase for the development of the application, a total of 5 meetings were held with the software developer. These were both face-to-face interviews and remote via Zoom interviews. In the interviews, the findings of the literature analysis, norm analysis, and competitor analysis were shared with the software developer. Furthermore, the name and logo of the app were discussed in two interviews. Table 4.13 shows the interview details (type, where, date, time as minute (min.), and subject) with the software developer.

Table 4.13. *Interviews with software developer*

ID	Meetings Type	Where	Date	Time (min.)	Subject
1	Face to face	Anadolu University	02.06.2022 10.00	120	General purpose of the dissertation and timeline
2	Zoom	74507420440	28.06.2022 16.00	120	Literature and user analysis
3	Face to face	Anadolu University	30.09.2022 11.00	50	Norm analysis
4	Zoom	76447638775	20.10.2022 15.00	80	Competitor analysis and logo and domain hosting
5	Zoom	78375752710	21.12.2022 16.15	45	Domain hosting and logo of the app

Researcher worked with a designer on the logo design of the app via zoom for the app to be uploaded to the app stores (Table 4.14). After the meetings, designer designed 5 logo samples.

Table 4.14. *Interviews with logo designer*

ID	Meetings Type	Where	Date	Time (min.)	Subject
1	Zoom	799 572 4053	02.12.2022 15.00	100	App functions and similar app logos
2	Zoom	799 572 4053	04.12.2022 21.15	120	First design feedbacks

One of them was selected as the logo of the app by the researcher, dissertation adviser, and the software developer (Image 4.1).



Image 4.1. *Logo of Stats&Goals*

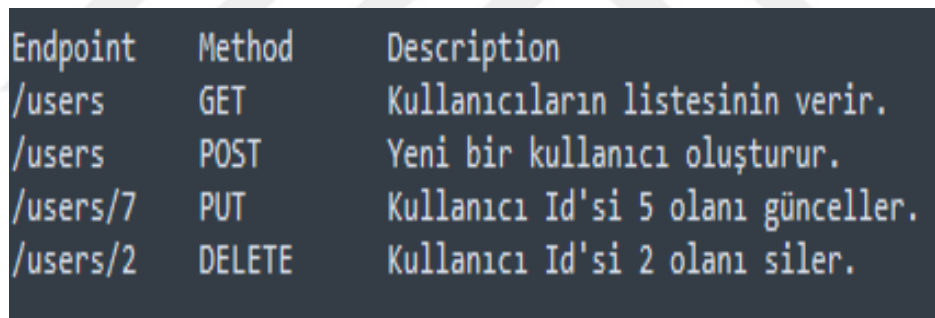
4.2. Second Phase: Developing the Design

Design-based research is an iterative and pragmatic research method and it leads to theoretical and practical knowledge production with iterations. In this context, the research question of design development was: *What are the technologies used to develop the mobile app?* To address this research question, information from the developer was compiled. The information on all technologies used to develop the mobile app was presented in five sections (i) app development frameworks and programming languages, (ii) designing drafts for the app interface, (iii) database technologies, (iv) the operation of the application infrastructure, and (v) the initial app design.

4.2.1. App development frameworks and programming languages

At the end of the first phase, the findings were shared with the software developer. The developer offered a hybrid application after the findings. It was decided to develop the app as a mobile application running on both Android and iOS operating systems. As a result of this process, Flutter was used to run the application on mobile devices. Flutter, one of the hybrid application development frameworks, was preferred because it

works on both Android and iOS operating systems. Developed by Google in 2017, Flutter is a free and open-source application interface toolkit. Dart programming language, developed by Google in 2011, was used to develop applications with Flutter. Laravel framework was used in the backend that provides API (Application Programming Interface) services. REST (Representational State Transfer) API architecture was used to enable the application developed with Flutter to communicate with the database. Mobile apps need APIs to save some data to the server. Saving data on the server helps data exchange between the app and users. In addition, when the application is removed from the phone and reinstalled, the deletion of user data will be prevented. REST architecture was used in the development of the API service of the mobile app. This architecture uses HTTP methods (GET, POST, PUT, DELETE) in sending data. It is simple, easy, and fast, and reduces duplication and workload. In REST architecture, data is transferred as JSON and XML. In the mobile app, it is preferred to transfer the data with JSON. An example of the methods and functions of REST architecture is given in Image 4.2.

A screenshot of a table with three columns: Endpoint, Method, and Description. The table lists four REST API endpoints for user management. The text is displayed in a monospaced font on a dark background.

Endpoint	Method	Description
/users	GET	Kullanıcıların listesinin verir.
/users	POST	Yeni bir kullanıcı oluşturur.
/users/7	PUT	Kullanıcı Id'si 5 olanı günceller.
/users/2	DELETE	Kullanıcı Id'si 2 olanı siler.

Image 4.2. *REST architecture*

PHP (Personal Home Page/Hypertext Preprocessor) programming language was used to provide API services for the mobile app to communicate with the database and to create the infrastructure of the software. MySQL (Structured Query Language) database which has a high-performance, stable, free database management system and is compatible with PHP was used to store and manage data in the application. MySQL can run on Linux, Microsoft Windows, and macOS operating systems. In software development processes, application frameworks that contain a lot of libraries are used. Laravel Framework, which is very popular among PHP developers in recent years, was used in the development of the API system. Apps can be developed quickly with

Laravel, whose syntax is very simple. Since the database structure is well-designed, it is possible to develop all kinds of applications (from simple applications to complex projects) with Laravel. There is no one and only framework for apps. In the software development process, a framework that has up-to-date technologies, community support, and easy-to-learn is chosen. Community support is directly related to the popularity of the framework.

4.2.2. Designing drafts for the app interface

Based on the interface outline, the interfaces of the mobile app which has Dart codes but are not connected to the API yet was developed. The purpose of this strategy is to ensure that the corrections are completed by taking opinions before the app is developed.



Image 4.3. *Login page*

At the end of the interviews in the first stage, an interface outline was proposed (Image 4.3).

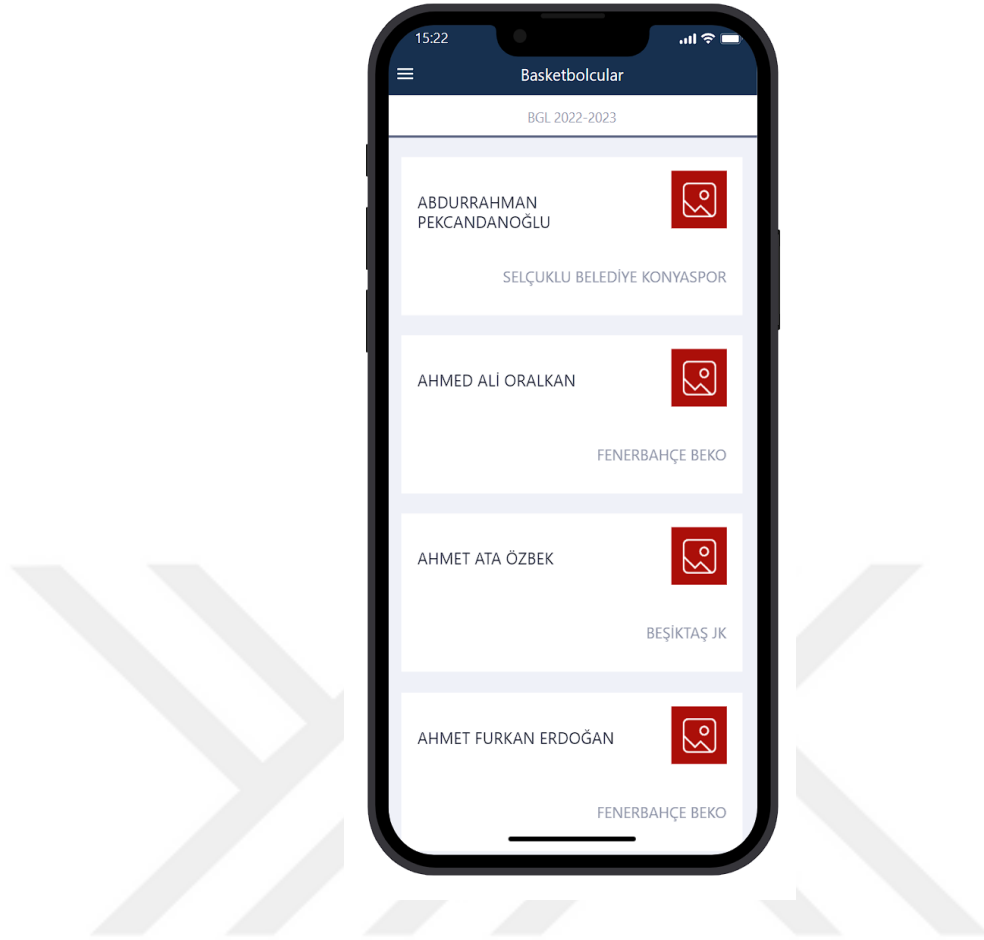


Image 4.4. *Player list page*

This page is designed to list the basketball players playing in the 2022-2023 season (Image 4.4).



Image 4.5. *Player statistic page*

This page is designed for basketball players' match statistics (Image 4.5).

4.2.3. Database technologies

Database tables are designed for storing data. The migrations feature in Laravel was used to create database tables.

To create a migration, it is sufficient to run the command “php artisan make:migration create_matches_table” on the command line in the Laravel project folder. This command helps to produce a migration file in a "database/migrations" folder. Codes can be written to perform the operations in the migration file. Image 4.6 shows how the table columns are defined in the migration file.

```

public function up()
{
    Schema::create( table: 'matches', function (Blueprint $table) {
        $table->id();
        $table->bigInteger( column: 'player_id');
        $table->string( column: 'team_1');
        $table->string( column: 'team_2');
        $table->time( column: 'duration')->default( value: '00:00:00');
        $table->integer( column: 'point')->default( value: 0);
        $table->integer( column: 'sa')->default( value: 0);
        $table->integer( column: '2s')->default( value: 0);
        $table->integer( column: 'sr')->default( value: 0);
        $table->integer( column: 'hr')->default( value: 0);
        $table->integer( column: 'tr')->default( value: 0);
        $table->timestamps();
    });
}

```

Image 4.6. *Laravel Migration file*

By running the "php artisan migrate" command in the Laravel project folder, a table can be created or columns can be updated according to the criteria of the Migration file. The table and its content produced by the run of the command are shown in Image 4.7.

#	Adı	Türü	Karşılaştırma	Özellikler	Boş	Varsayılan	Açıklamalar	Ekstra	Eylem
☐	1 id	bigint(20)		UNSIGNED	Hayır	Yok		AUTO_INCREMENT	Değiştir Kaldır Daha fazla
☐	2 player_id	bigint(20)			Hayır	Yok			Değiştir Kaldır Daha fazla
☐	3 team_1	varchar(255)	utf8mb4_unicode_ci		Hayır	Yok			Değiştir Kaldır Daha fazla
☐	4 team_2	varchar(255)	utf8mb4_unicode_ci		Hayır	Yok			Değiştir Kaldır Daha fazla
☐	5 duration	time			Hayır	00:00:00			Değiştir Kaldır Daha fazla
☐	6 point	int(11)			Hayır	0			Değiştir Kaldır Daha fazla
☐	7 sa	int(11)			Hayır	0			Değiştir Kaldır Daha fazla
☐	8 2s	int(11)			Hayır	0			Değiştir Kaldır Daha fazla
☐	9 sr	int(11)			Hayır	0			Değiştir Kaldır Daha fazla
☐	10 hr	int(11)			Hayır	0			Değiştir Kaldır Daha fazla
☐	11 tr	int(11)			Hayır	0			Değiştir Kaldır Daha fazla
☐	12 created_at	timestamp			Evet	NULL			Değiştir Kaldır Daha fazla
☐	13 updated_at	timestamp			Evet	NULL			Değiştir Kaldır Daha fazla

Image 4.7. *Database table*

Below are the tables and tasks created using Laravel's migrations feature for the Stats&Goals (Table 4.15).

Table 4.15. *Tables and tasks created using Laravel's migrations*

users	It is the database table where user data (such as login information, authorization levels, etc.) is saved.
players	The characteristics of the basketball players are in this table.
seasons	The season data of the players is in this table. The season data of the games is matched with the data in this table.
teams	Team data (name, logo, etc.) is in this table.
matches	Game data is in this table. The players table is used to bridge between the games and the players.
match_details	The details of the games are in this table. This table has game detail data, which is more than the basic data in the matches table.
goals	The goals of basketball players are in this table. The goals and other game statistics are set by comparing this table.
personal_access_tokens	The token data that users use to log in is in this table.
stats	Statistics data is in this table. Statistics data produced according to matches, match_details and goals tables are stored in this table. Individual performance statistics of players are sent to the app from this table.

4.2.4. The operation of the application infrastructure

While Flutter was used to run the application on mobile devices, Laravel framework was used in the backend that provides API services. REST API architecture was used to enable the application developed with Flutter to communicate with the database. The structure of the connection between the app and the API service is given in Image 4.8.

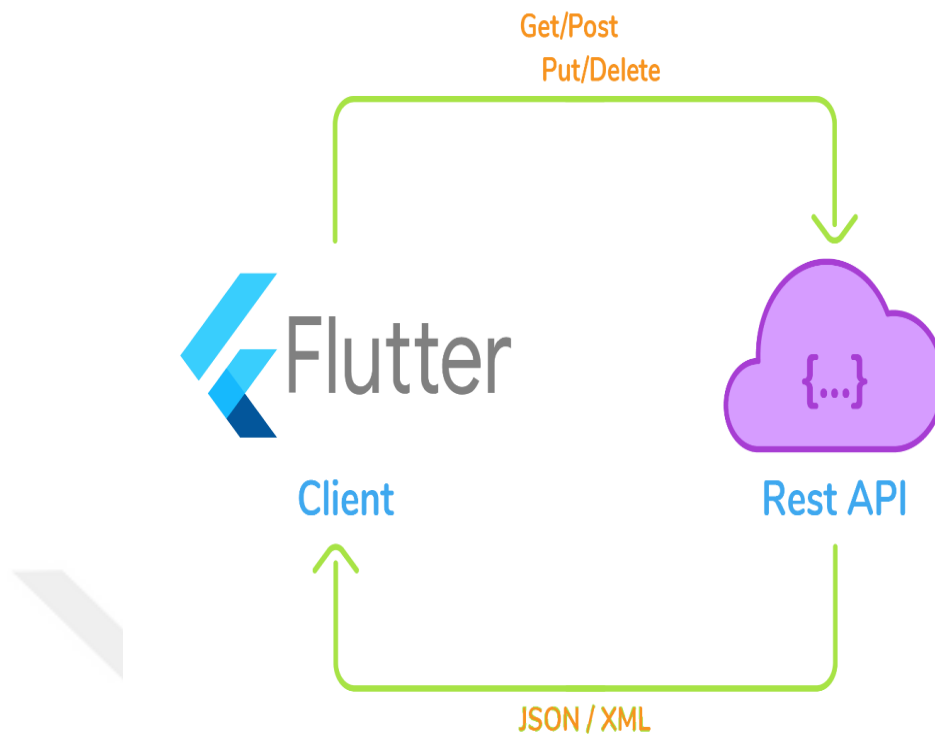


Image 4.8. Connection between the app and the API service

Laravel allows using of MVC (Model-View-Controller) structure while developing apps. Requests to the Route layer are transferred to the specified Controller class. The classes in the Controller layer direct the requests from the Route layer to the database or page templates. These classes represent an endpoint for other classes, are stateless, and manage the control flow (Aniche et al., 2018). The model layer is the bridge between the application and the database. The database is questioned according to the parameters from the Controller layer and the answers are sent back to the Controller layer. If a response is found for the user, this response is sent to the View layer. The View layer is the layer where the interface design codes of the app are developed and sent to the Controller. The view layer is rarely used in this app. The data is transmitted directly from the Controller to the Client (Client) in JSON format. The MVC structure used in Laravel is in Image 4.9.

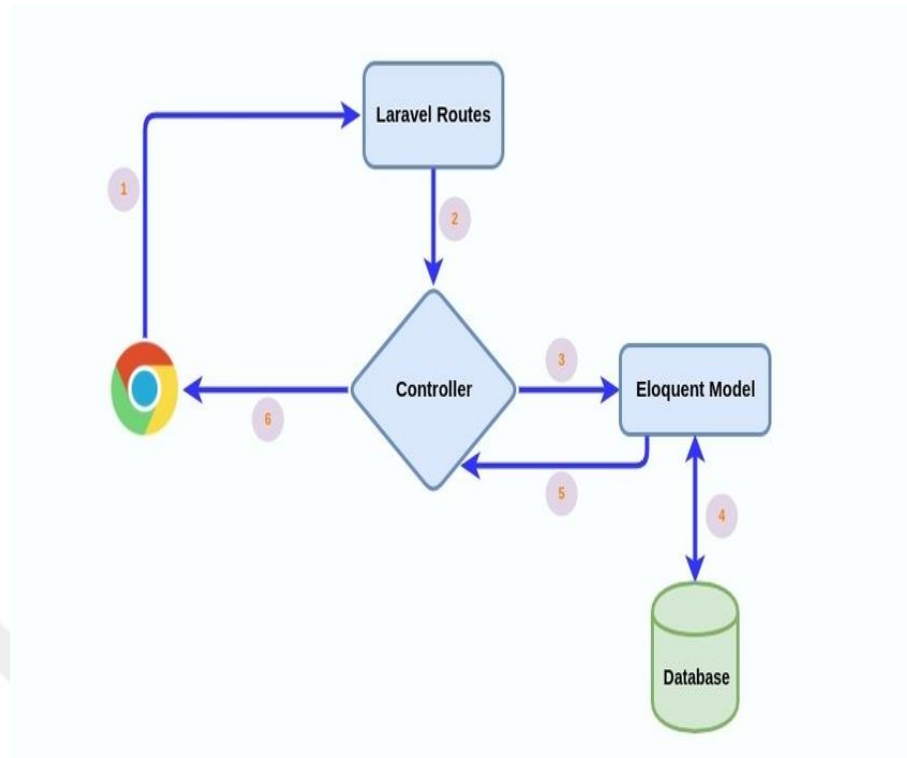


Image 4.9. MVC (Model-View-Controller) Structure

In Image 4.9, the life cycle of a request by the user is also shown. The lifecycle of a request, respectively:

Step 1: Sending the user request to the app and receiving the request by the Route layer,

Step 2: Forwarding the received request to the Controller class in the Route class,

Step 3: Sending significant parameters to the model in which the database will be queried in the Controller class,

Step 4: Sending the SQL query requested from the Model to the database management system and sending the raw data from the database management system back to the Model,

Step 5: Converting the raw data from the database management system into an object and sending it to the Controller class, which sends the query request to the model,

Step 6: Processing the database answers from the Model and sending them to the user.

When the users send a request via the internet browser or when a request is sent to the REST API layer via the mobile application, the request first comes to the route layer. Example codes of a route group are shown in Image 4.10.

```
Route::group(['prefix' => 'user', 'as' => 'user.'], function () {
    Route::get( uri: 'index', [\App\Http\Controllers\Admin\UserController::class, 'index'])->name( name: 'index');
    Route::get( uri: 'create', [\App\Http\Controllers\Admin\UserController::class, 'create'])->name( name: 'create');
    Route::post( uri: 'store', [\App\Http\Controllers\Admin\UserController::class, 'store'])->name( name: 'store');
    Route::get( uri: '{userId}/edit', [\App\Http\Controllers\Admin\UserController::class, 'edit'])->name( name: 'edit');
    Route::post( uri: '{userId}/update', [\App\Http\Controllers\Admin\UserController::class, 'update'])->name( name: 'update');
});
```

Image 4.10. Codes of Laravel Route layer

In a Route operation, it is defined which method (such as get, post) the operation will use, which address it will have, which Controller method it will be directed to and what its name will be. The request is processed at the Route layer and directed to the Controller class it belongs to. Some codes of the Controller class named UserController are shown in Image 4.11.

```
<?php
namespace App\Http\Controllers\Admin;
use ...

class UserController extends Controller
{
    private UserService $userService;
    private UserGroupService $userGroupService;

    /**
     * @param UserService $userService
     * @param UserGroupService $userGroupService
     */
    public function __construct(UserService $userService, UserGroupService $userGroupService)
    {
        $this->userService = $userService;
        $this->userGroupService = $userGroupService;
    }

    public function index()
    {
        $users = $this->userService->getUsers();
        return view( view: 'admin.user.index', compact( var_name: 'users') );
    }

    public function create()
    {
        $userGroups = $this->userGroupService->getUserGroups();
        return view( view: 'admin.user.create', compact( var_name: 'userGroups') );
    }
}
```

Image 4.11. Codes for Laravel Controller layer

In the Controller class, the request is run and answers come by request. If it is required to be retrieved data from the database, a request is sent to the Model class. The

data for the request is sent to the View layer and shown to the user. If no data will be retrieved from the database, it is sent directly to the view layer. Some codes of the model named User are shown in Image 4.12.

```
<?php

namespace App\Models;

// use Illuminate\Contracts\Auth\MustVerifyEmail;
use ...

class User extends Authenticatable
{
    use HasApiTokens, HasFactory, Notifiable, SoftDeletes;

    /**
     * The attributes that are mass assignable.
     *
     * @var array<int, string>
     */
    protected $fillable = [
        "type",
        "user_group_id",
        "name",
        "surname",
        "identity",
        "email",
        "device_token",
    ]
}
```

Image 4.12. Codes of Laravel Model layer

The \$fillable part of the model shows how the fillable fields in the table are defined. The last layer of the MVC structure is the View layer. The View layer is the layer where the interface that the user sees is coded. Example codes of the View layer are shown in Image 4.13. Views in Laravel use design templates called Blades. The data from the Controller is displayed in the Blade templates and the interface design of the app is ended.

```
@extends('admin.parent')

@section('content')
<div class="app-main flex-column flex-row-fluid" id="kt_app_main">

    <div class="d-flex flex-column flex-column-fluid">
        <div id="kt_app_toolbar" class="app-toolbar py-3 py-lg-6">
            <div id="kt_app_toolbar_container" class="app-container container-fluid d-flex flex-stack">
                <div class="page-title d-flex flex-column justify-content-center flex-wrap me-3">

                    <h1 class="page-heading d-flex text-dark fw-bold fs-3 flex-column justify-content-center my-0">Kullanıcılar</h1>

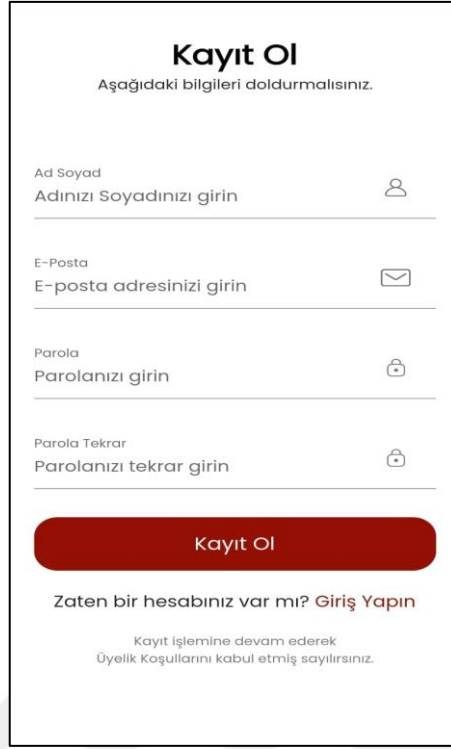
                    <ul class="breadcrumb breadcrumb-separatorless fw-semibold fs-7 my-0 pt-1">

```

Image 4.13. Codes for Laravel View layer

4.2.5. The initial app design

At the end of the second phase, the initial app design was shared with the researcher. The first mobile application runs only on Android systems. And some pages were not active. The images of the active pages are below.



Kayıt Ol
Aşağıdaki bilgileri doldurmalısınız.

Ad Soyad
Adınızı Soyadınızı girin

E-Posta
E-posta adresinizi girin

Parola
Parolanızı girin

Parola Tekrar
Parolanızı tekrar girin

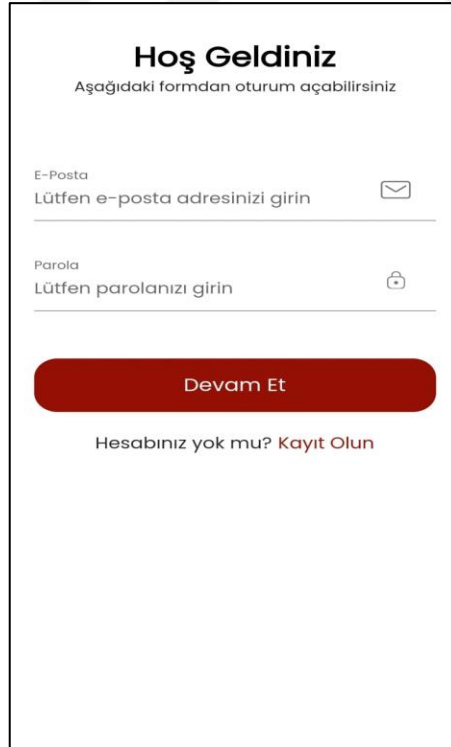
Kayıt Ol

Zaten bir hesabınız var mı? **Giriş Yapın**

Kayıt işlemine devam ederek
Üyelik Koşullarını kabul etmiş sayılırsınız.

Image 4.14. Sign up page of the initial app design

Sign up page of the initial app design is shown in Image 4.14.



Hoş Geldiniz
Aşağıdaki formdan oturum açabilirsiniz

E-Posta
Lütfen e-posta adresinizi girin

Parola
Lütfen parolanızı girin

Devam Et

Hesabınız yok mu? **Kayıt Olun**

Image 4.15. Log in page of the initial app design

Log in page of the initial app design is shown in Image 4.15.

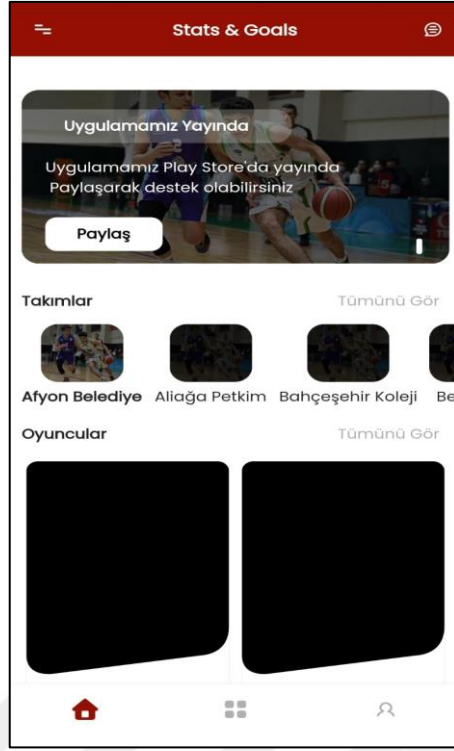


Image 4.16. Main page of the initial app design

Main page of the initial app design is shown in Image 4.16.

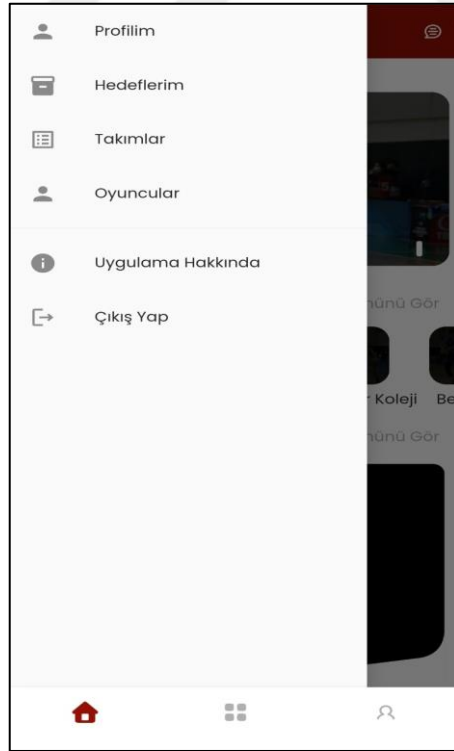


Image 4.17. Navigation menu of the initial app design

Navigation menu of the initial app design is shown in Image 4.17.



Image 4.18. My profile page of the initial app design

My profile page of the initial app design is shown in Image 4.18.

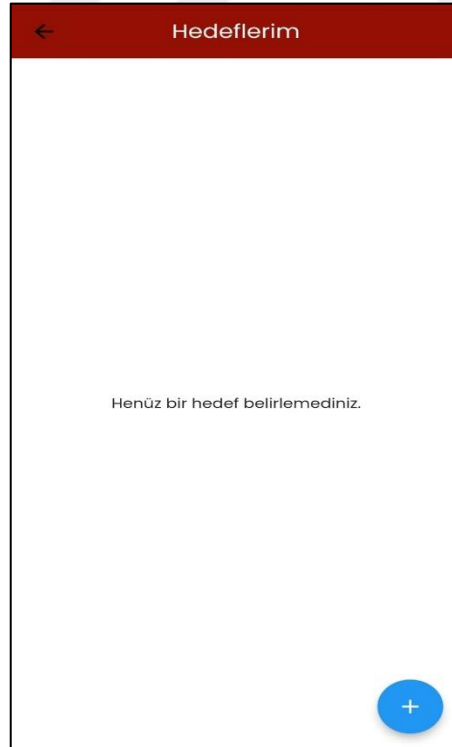


Image 4.19. My goals page of the initial app design

My goals page of the initial app design is shown in Image 4.19.

Image 4.20. Set a goal pages of the initial app design

Set a goal pages of the initial app design are shown in Image 4.20.



Image 4.21. Players page of the initial app design

Players page of the initial app design are shown in Image 4.21.

4.3. Third Phase: Improving the Design

Design-based research is a context-focused and iterative research method. In this context, two improvement cycles were carried out during the improvement phase. The feedback from each cycle was used to improve the app design. The improvement cycle process was given in Figure 4.2.

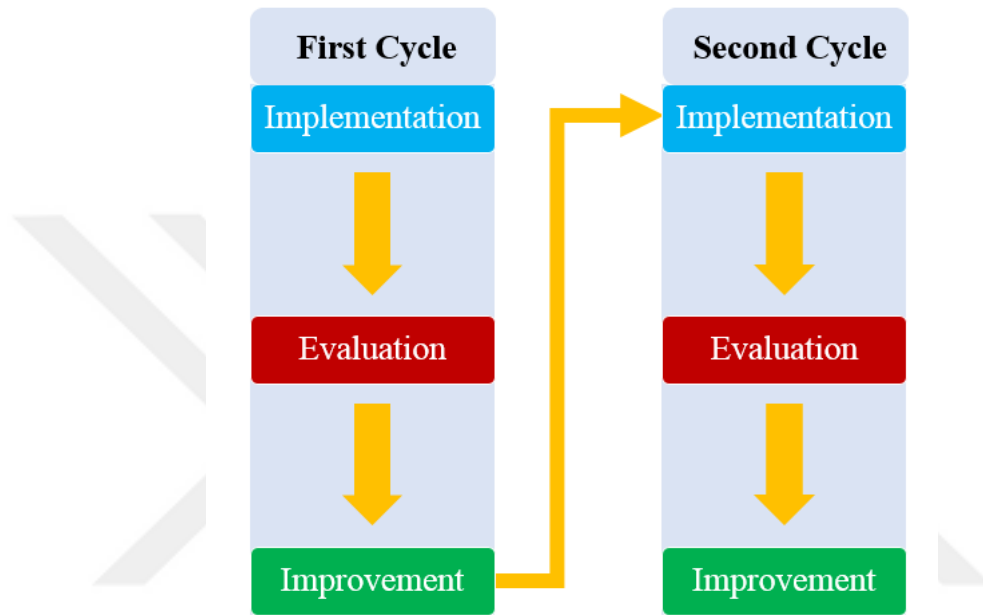


Figure 4.2. *Improvement cycles*

Each improvement cycle had 3 steps. These were the implementation, evaluation, and improvement steps. The first improvement step was linked to the second implementation step.

4.3.1. The first improvement cycle

After the initial app design was shared with the researcher, the researcher shared his comments on the design with the software developer. The researcher gave feedback for almost all pages and functions of the app. Some of these include adding height, weight, and position to the signup page; adding infoboxes to show what the stats mean, and changing the design of my goals tab. Then, the software developer updated the initial design with the researcher's feedback. The images of the application pages after the update are below.

Kayıt Ol	
Aşağıdaki bilgileri doldurmalısınız.	
Ad Soyad	Adınızı Soyadınızı girin
E-Posta	E-posta adresinizi girin
Parola	Parolanızı girin
Parola Tekrar	Parolanızı tekrar girin
Mevki	Mevkinizi girin
Kilo (kg)	Kilonuzu girin
Boy (cm)	Boyunuzu girin
Kayıt Ol	
Zaten bir hesabınız var mı? Giriş Yapın	
Kayıt işlemine devam ederek Üyelik Koşullarını kabul etmiş sayılırsınız.	

Image 4.22. Sign up page of the second app design

Sign up page of the second app design is shown in Image 4.22.

Hoş Geldiniz	
Aşağıdaki formdan oturum açabilirsiniz	
E-Posta	Lütfen e-posta adresinizi girin
Parola	Lütfen parolanızı girin
Devam Et	
Hesabınız yok mu? Kayıt Olun	

Image 4.23. Log in page of the second app design

Log in page of the second app design is shown in Image 4.23.

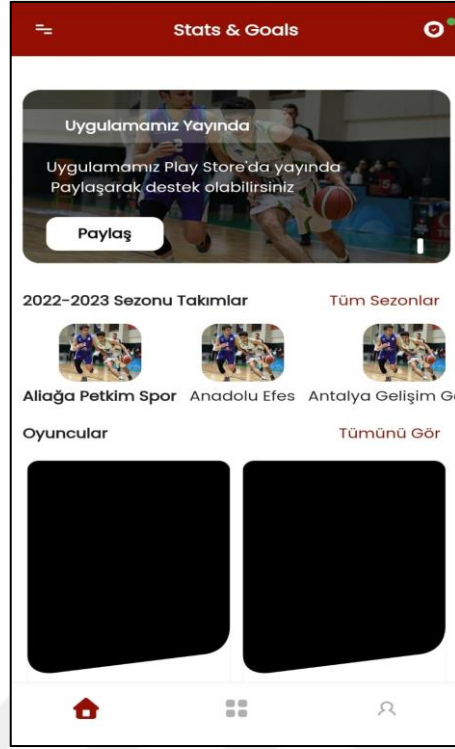


Image 4.24. Main page of the second app design

Main page of the second app design is shown in Image 4.24.

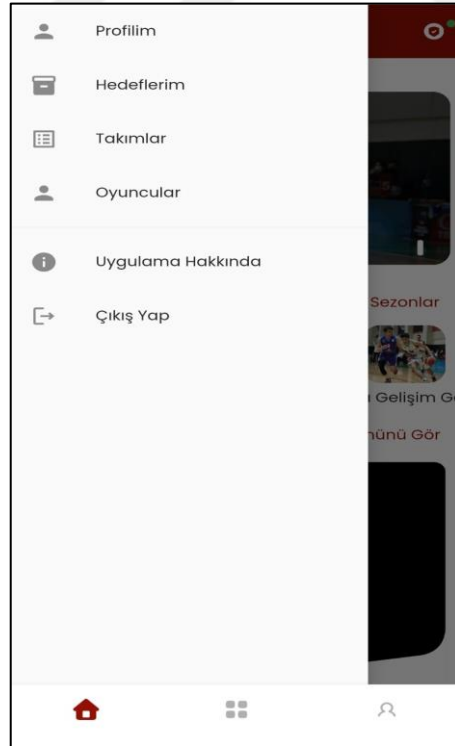


Image 4.25. Navigation menu of the second app design

Navigation menu of the initial app design is shown in Image 4.25.

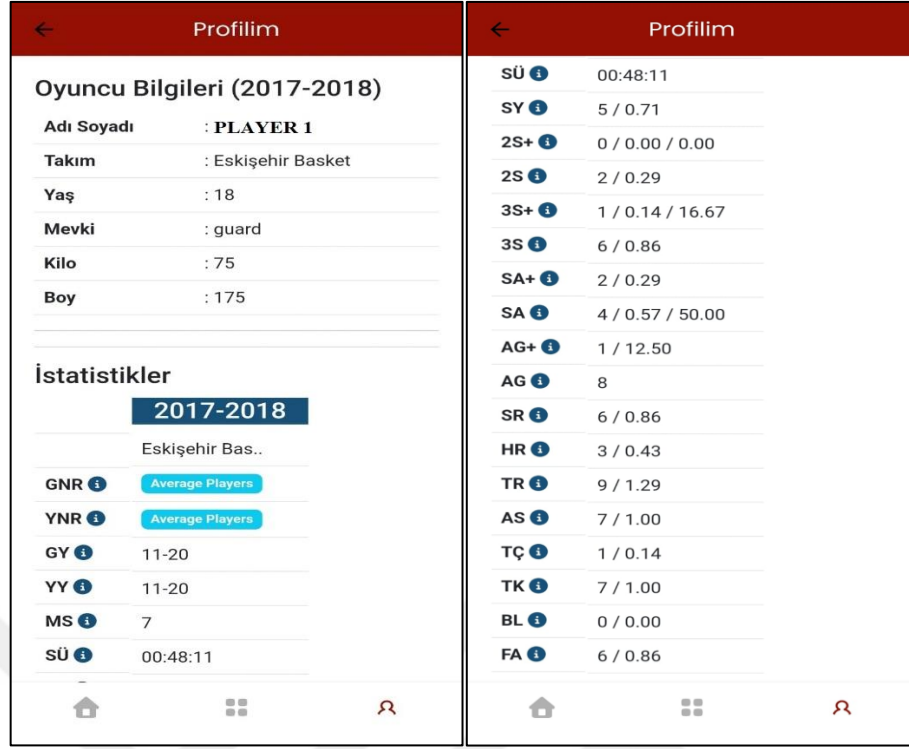


Image 4.26. My profile page of the second app design

My profile page of the second app design is shown in Image 4.26.



Image 4.27. My goals page of the second app design

My goals page of the second app design is shown in Image 4.27.

The image displays three sequential mobile app screens for the 'Hedef Ekle' (Add Goal) feature. Each screen has a red header with a back arrow and the title 'Hedef Ekle'.
 - The first screen shows a form with three main sections: a dropdown for 'Hedef Tipi', a dropdown for 'Hedef Adı', and a text area for 'Hedefinizi buraya yazın'. Below these is a larger text area for 'Hedefinize dair notları buraya yazabilirsiniz' and a red 'Hedefimi Kaydet' button.
 - The second screen shows the 'Hedef Tipi' dropdown menu open, with two options: 'Maç Hedefi/Performans Hedefi' and 'Sezon Hedefi'.
 - The third screen shows the 'Hedef Adı' dropdown menu open, displaying a list of team abbreviations: MS, VP, SÜ, SY, 2S+, 2S, 3S+, 3S, SA+, SA, AG+, AG, SR, HR, TR, AS.

Image 4.28. Set a goal pages of the second app design

Set a goal pages of the second app design are shown in Image 4.28.

The image shows a mobile app screen titled 'Sezon Seç' (Select Season) with a red header and a back arrow. The screen displays a grid of six season options in a 3x2 layout: 2022-2023, 2021-2022, 2020-2021, 2019-2020, 2018-2019, and 2017-2018. Each option is presented in a white box with a red border and red text.

Image 4.29. All seasons page for team page of the second app design

All seasons page for teams of the second app design is shown in Image 4.29.



Image 4.30. *Players page of the second app design*

Players page of the second app design is shown in Image 4.30.

Oyuncu Profili		
PLAYER 1 vs PLAYER 2		
İstatistikler		
	PLAYER 1	PLAYER 2
	2017-2018	2017-2018
	Eskişehir Bas..	Eskişehir Bas..
GNR	Average Players	All Stars
YNR	Average Players	All Stars
GY	11-20	91-99
YY	11-20	91-99
MS	7	18
SÜ	00:48:11	08:56:59
SY	5	327
2S+	0	90
2S	2	170
3S+	1	23
3S	6	92

Oyuncu Profili		
SY	5	327
2S+	0	90
2S	2	170
3S+	1	23
3S	6	92
SA+	2	78
SA	4	118
AG+	1	113
AG	8	262
SR	6	98
HR	3	21
TR	9	119
AS	7	61
TÇ	1	29
TK	7	82
BL	0	8
FA	6	56

Image 4.31. *Compare with me results pages of the second app design*

Compare with me results page of the second app design is shown in Image 4.31.

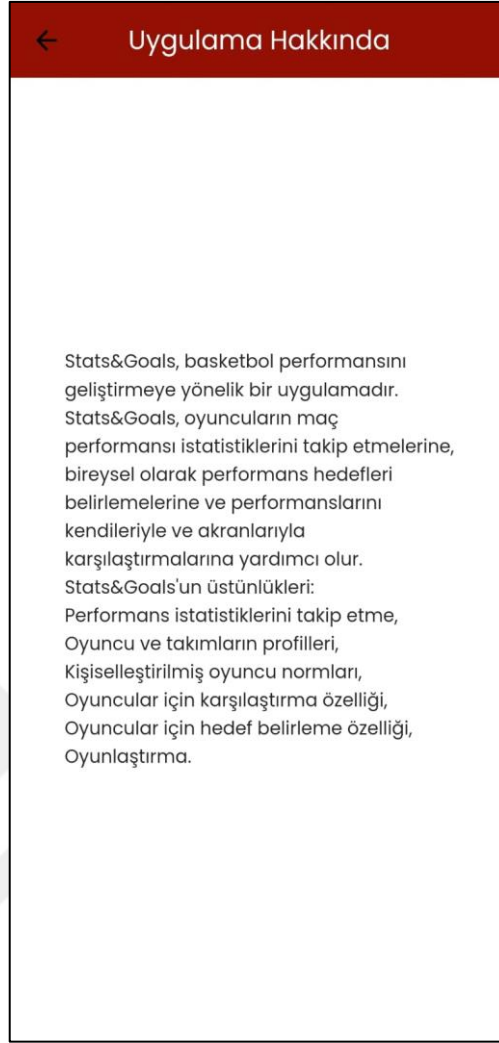


Image 4.32. About app page of the second app design

About app page of the second app design is shown in Image 4.32.

4.3.2. The second improvement cycle

After completing the first update, in order to develop the application in accordance with the context-focused nature of the DBR, the design improvement research question was: *What are the mobile app opinions and experiences of the players?* The qual usability test which has different tasks, semi-structured interview questions, and survey questions was used to address this research question. Qualitative data were presented according to their themes with an inductive and holistic perspective (Table 4.16).

Table 4.16. *Themes of app opinions and experiences of the players*

Themes	Categories	Codes
WEB 2.0 app	Individualized app	- Log in - Sign up
User-friendly app	Ease of use	- Easy log in - Simple design - No need to match with my information
Personalized app	Personal information	- Teams - Players - All seasons - My profile
	Performance statistics	- Match statistics - Tracking own statistics - Confusing statistics - Detailed statistics - Objective statistics
	Social comparison	- Comparing your own performance with yourself - Comparing your own performance with teammates - Comparing your own performance with similar players
Customized app		- Comparing your own performance with rivals
Notification	Goal-setting	- Goal-setting - Optional goal types - Optional setting different goals - Self-determined goals - Saving goals
	Feedback	- Feedback
	Team building	- Achieving a goal or not - Positive effects on team
Indirect advantages	Guiding basketball stakeholders	- Guide basketball coaches - Guide managers
	Selecting players	- Selecting and transferring players
	Player search tab	- Tab for searching players
Suggestions	Easy log in	- Player position categorization
	Familiar interface design	- Similar design to the match score sheet
	Personal photos and formal logos	- Player photos and team logos to recognize them
	Visible and editable goals	- Visible goal descriptions and editable goals
	Training programs for goals	- Roadmaps for achieving goals

Players were given to sign up for the app in the first task of the qualitative usability test. The fact that the players create an account to use the application shows that the application is a WEB 2.0 application. In line with this, one of the players, P2 voiced that "... I create an account by filling in my name and surname. I filled in my position. I filled in my weight. I filled in my height and sign up. I logged in."

In this context, while there was the "individualized app" category under the "WEB 2.0 app" theme; there were "log in" and "sign up" codes under this category.

Furthermore, players stated that they had easy and simple access to the application in the first task and that they saw their statistics directly in their accounts.

Some of the players' comments on this task were:

P1: *"...I was able to log in easily. Nothing else caught my eye. So I could logged in directly."*

P2: *"So it's actually an easy login. The home page is already in front of us. When we entered our e-mail and password, we were able to log in easily."*

In this context, while there was the "ease of use" category under the "user-friendly app" theme; there were "easy login", "simple design", and "no need to match with my information" codes under this category.

Players were given to surf on the app in the second task of the qualitative usability test. Players said they had direct access to their personal information and performance statistics in the app.

Some of the players' stated on this task:

P1: *"... When I click on the players, they are presented directly from here as a ranking. I think I'm in my profile right now. All seasons. There is also the seasons' section. Here I can choose a season and find out the season I played in. Nice features."*

"I think the player can check their own statistics. In other words, he can compare himself from one season to another season, or if he has another rival, he can compare himself with him who plays in the same position. Or he can use it to improve himself. The player can see his pros and cons."

"... My own profile appears directly without selecting it when I log in to the profile. I don't have to do anything to choose myself in the profile section anyway."

P2: *"...what my eye really caught were the teams right now. I'm looking at the BGL teams of the 2022-2023 season. They caught my attention. And the part right above it that was written all seasons actually caught my attention. I can go back to the season I played. I can see the teams in the season I played, these are good features. The things I liked. As far as I can see, there are player statistics, I mean player profiles at the bottom. It is formed in alphabetical order. These are also good features of the app."*

In this context, there were the "personal information" and "performance statistics" categories under the "personalized app" theme. While there were "teams", "players", "all seasons" and "my profile" codes under the "personal information" category; there

were "match statistics", "tracking own statistics", "confusing statistics", "detailed statistics", and "objective statistics" codes under the "personal statistics" category.

While players were given to compare their performance with their peers in the third task of the qualitative usability test; they were given to set two goals in the fourth task of the test. While the players emphasize that they can compare their performance with themselves, their teammates, players with similar characteristics, and their opponents during the third task; they stated that during the fourth task, they can set many types of goals according to their preferences and they can record and track these goals.

Some of the players' comments on these tasks were:

P1: *"...compare with me. In other words, after choosing the player directly, there was a compare with me section. I click it now. There is what we both did in the same season. It says how many minutes we played, how many rebounds we took, and how many scores we made in the game. All of them are written here, sir. I can directly compare myself with using all of them."*

P2: *"...I think he was an important player for our team that year. I choose Mahmut Can. I compared Mahmut Can with myself. Here, the statistics of both players have been presented. Minutes played and scores, these are important statistics for us."*

P3: *"...let me tell you this way, I think it's a good thing that when we click the button and it immediately shows statistics. I even click it again and it is presented directly. I think it's a nice thing (performance). As I said, even a person who does not know basketball can understand this quite clearly."*

P1: *"...When I click from the top of the left, my goals section appeared. Season goal. Here I can create a new goal for myself. I can write the goal type myself. It shows a season goal, a match goal, and a performance goal."*

P2: *"I click my goals section. As the goal type, I choose the season goal. I choose the 3-point goal as the goal type. So my goal here is actually about the fact that I should try more 3-point. I think my 3-point percentage should increase. I can write my goal. Yes, I wish my 3-point try was more. This is my first goal..."*

"...And I saved this goal as well. My 2 goals are now appearing in front of me on my goals page...."

P3: *"... I click the goal and I write. I am choosing the goal type: match goal and season goal. I always like to go match by match. I don't think of it as a season. I am such a player..."*

In this context, there were the "social comparison" and "goal-setting" categories under the "customized app" theme. While there were "comparing your own performance with yourself", "comparing your own performance with teammates", "comparing your own performance with similar players" and "comparing your own performance with rivals" codes under the "social comparison" category; there were "goal-setting", "optional goal types", "optional setting different goals", "self-determined goals", and "saving goals".

The themes of notification, indirect advantages, and suggestions were yielded with probe questions and semi-structured interview questions during the qualitative usability test.

One of the players' comments on the "notification" theme was:

P1: *"There is also a section saying whether you achieved a goal or not. It is designed as a status. After the match, if I reached the goal that I wanted to achieve, it will write it was achieved there. From here I can see what I achieved and what I didn't achieve..."*

In this context, there was the "feedback" category under the "notification" theme. There were "feedback" and "achieving a goal or not" codes under the "feedback" category.

Some of the players' comments on the "indirect advantages" theme were:

P1: *...I think it's good for both the coach and the player. The players can use the app to improve themselves. In addition, coaches can also learn the characteristics of the all players on the opposing team.*

P2: *... such applications are very valuable for us basketball players and basketball coaches.*

... it will have a huge impact on every player. It affects both the player and the team. If the player develops himself, his team will progress in a positive way.

P3: *...when teams and general managers are looking for players, they can also look at us from this application....*

... thanks to such applications, some things are heard, seen, and known. Such apps are taken into account more during the transfer season.

In this context, there were the "team building", "guiding basketball stakeholders", and "selecting players" categories under the "indirect advantages" theme.

Some of the players' comments on the "suggestions" theme were:

P1 interview note: *"It would be nice if there was a shortcut to search for players."*

P2: *"...after setting my goals, I would like to have a roadmap (training program) on how I can reach these goals."*

P3: *"In my opinion, when we click directly the positions while we sign up, for example, all the positions from one to five, etc. should present as a category. I think it would be better if it is presented this way. You know, it will be easier for the user and it will look nicer."*

"... It would be easier if the statistics were presented as on the scoresheet of the match, but this is also nice...."

"..and let me say this, I think it would be nicer if the logo of the team rather than a random photo while surfing through the teams...."

"...and goal-setting page...it would be better to see the descriptions of my goal there after I save my goal..."

"...I think it would be better if we put player photos. Because you know we know most of the people in basketball face to face. You know, we don't know their names..."

In this context, there were the "player search tab", "familiar interface design", "personal photos and formal logos", "visible and editable goals", and "training programs for goal" categories under the "suggestions" theme.

In summary, seven themes were yielded from the qualitative data. These were the WEB 2.0 app, user-friendly app, personalized app, customized app, notification, indirect advantages, and suggestions.

As the qualitative usability test was combined with survey questions, it provided quantitative data as well as qualitative data. Descriptive statistics of the players' opinions were presented according to the tasks (Table 4.17). The average of each task is

above 4 (Task 1=4.60±.55; Task 2=4.00±.71; Task 3=4.40±.55; Task 4=4.00±.71). The overall design score of the application is 4.60±.55 in the survey.

Table 4.17. Descriptive statistics of the players for survey questions in the qual user test

	n	$\bar{x}$	Sd	Min	Max
Task 1	5	4.60	0.55	1	5
Task 2	5	4.00	0.71	1	5
Task 3	5	4.40	0.55	1	5
Task 4	5	4.00	0.71	1	5
Overall Design	5	4.60	0.55	1	5

4.4. Mixed Methods Integrative Results

Design-based research (DBR) is an integrative process. Therefore, in order to develop the application in accordance with the integrative nature of the research method, the mixed methods integration research question was: *How do participants' opinions and experiences on the mobile application contribute to the products of the norm and app development processes?* The mixed methods integrative analysis was used to address this research question and merge the data.

A joint display table was presented that emerged from the integrated analysis of quantitative analysis findings and qualitative analysis findings for the app development process (Table 4.18). All the process was expressed by the narrative technique below the table.

Table 4.18. Joint displays for app development process

Design-Based Research (Powered by Literature Analysis, Norm Development, Competitor Analysis, User Experiences (UX) Research, Think-Aloud Technique, Content Analysis, and Mixed Methods Integrative Analysis (joint displays and narratives by constant comparison technique))			
Planning Phase	Development Phase	Improvement Phase	Mixed Methods Integration
- Literature analysis • Team development linear theory • Goal-setting theory • Cognitive evaluation theory • Social comparison theory • Intrinsic motivation • Fogg behavior model and gamification • Basketball statistics and player efficiency ratio	- Theory-based design - Badges for gamification - Designing drafts for the app interface - Database technologies - The operation of the application infrastructure	<u>Qualitative Usability Test</u> - Seven themes by qual data • WEB 2.0 app • User-friendly app • Personalized app • Customized app • Notification • Indirect advantages • Suggestions - Survey scores • Task 1=4.60±.55 • Task 2=4.00±.71 • Task 3=4.40±.55 • Task 4=4.00±.71 • Overall Design= 4.60±.55	- Stats&Goals was designed as a WEB 2.0 application in the development phase as a result of digital analysis of target users and competitor analysis findings in the planning phase. The fact that the players create an account to use the application shows that the application is a WEB 2.0 application. - During the planning phase, it was decided to use a design-based research methodology and adopt a user-centered design while designing the application. The improvement phase findings showed that players can access the app simply and easily and see their personal data and performance statistics. These findings showed that Stats&Goals is user-friendly and personalized app and has a user-centered design as planned. - Competitor analysis and literature analysis during the planning phase of the application guided to compare the performances of the players with themselves and their peers and to set goals for their individual performances. Furthermore, the norms developed during the planning phase of the application were added to the set a goal" feature, considering that they would support the players' goal-setting. In line
- Digital characteristics of the target users • WEB 2.0 • Android and iOS operating systems - No significant difference between seasons ($F_{(4,1471)}=1.807$; $p=.125$; $\eta^2=.005$) - Significant difference between the ages of the players ($F_{(2,1553)}=235.834$; $p=.000$; $\eta^2=.221$) 19/20>18*** Tamhane 19/20>15/16/17*** 18>15/16/17*** - Norms were developed for general and age variables (15/16/17-18-19/20)	- App development framework & Programming languages - User-centered hybrid app - Gamification • Badges • Leaderboards		
<u>5 norms</u> MVP Candidates 1-10 All-Stars 11-20 Stars 21-30 Average Players 31-40 Rotation Players 41-50	<u>10 percentages</u>		

51-60					
61-70	National				
71-80	Player				
81-90	Candidates				
91-99					
- Norms and percentages have consistency					
<u>Competitors analysis</u>			-WEB 2.0		
- WEB 1.0 & WEB 2.0			- Responsive Design		
- Responsive Design			-Optional feedback		
- No feedback (notifications)			(notifications)		
- No goal-setting			- Goal-setting		
- Social comparison			-Social comparison		
- Unregular Gamification			-Gamification		
<u>Interviews with the stakeholders</u>					
- Name and domain hosting			Stats&Goals		
- Logo design					

with this, compare with me and set goals pages were created during the development phase. While the improvement phase findings show that the players use the "compare with me" feature comfortably; stated that there is a need for improvements in the "set a goal" feature.

- The norms which were developed during the planning phase of the application were used as badges and leaderboards in the context of gamification during the development of the application. The improvement phase findings showed that norms should be emphasized more in design. Therefore, infoboxes were added to the acronyms for all stats and norms.

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This research aimed to develop a mobile app by using quantitative and qualitative data in three phases, combined norm development research and user experience research under the umbrella of design-based research methodology. In this research, the aim of using quantitative and qualitative data is to provide complementarity, development, and triangulation.

Both quantitative and qualitative data types were used in both the norm development process and qualitative usability tests. While using qualitative data for the norms' consistency during the norm development process; in the qualitative usability tests, the opinions were checked by the survey questions. In addition, the qualitative findings of the development phase provided complementarity, development, and triangulation of the quantitative findings of the planning phase as aimed.

The mixed methods integrative results show that the youth players have five norms according to the efficiency scores in terms of the seasons and age variables. These results showed these norms have consistency with experts' opinions. One of the experts emphasized that age is an important factor for BYL during the norm development process of the planning phase. In the preliminary analyses for finding the significant factors for the norms, while there was no significant difference between the seasons; there was a significant difference between the age groups. In other words, qualitative data are compatible with quantitative data. Therefore, age norms were developed based on group values. In other words, the app allowed players both to determine their performance in the general classification and to determine their place in their own age groups. In terms of measurement and evaluation literature, the app gave the opportunity to report both general summative evaluation and summative evaluation by age group.

The mixed methods integrative results showed that the application is useful and satisfying. Qualitative usability tests test combined with survey questions were used during the development phase. The WEB 2.0 app, user-friendly app, personalized app, customized app, notification, indirect advantages, and suggestions themes were yielded from the qualitative data by content analysis. The overall design score of the application was found $4.60 \pm .55$ from the quantitative data by descriptive analysis. While the qualitative data of the qualitative usability test showed that the players found the

application useful; quantitative data showed that they were satisfied with the application.

Stats&Goals was designed as a WEB 2.0 application in the development phase as a result of digital analysis of target users and competitor analysis findings in the planning phase. The fact that the players create an account to use the application shows that the application is a WEB 2.0 application. In line with this, one of the players, P2 proved that the application is a WEB 2.0 application by creating an account to use the application and expressed the process of creating an account to use the application: *"... I create an account by filling in my name and surname. I filled in my position. I filled in my weight. I filled in my height and sign up. I logged in."*

During the planning phase, it was decided to use a design-based research methodology and adopt a user-centered design while designing the application. In this context, a user-centered design-based research method was used while developing the application. The improvement phase findings showed that players can access the app simply and easily and see their personal information and performance statistics. In other words, Stats&Goals is a user-friendly personalized app. These findings show that the application is user-friendly and has a user-centered design as planned. In line with this, one of the players, P1 explained that the application is user-friendly, with the phrase: *"...I was able to log in easily. Nothing else caught my eye. So I could logged in directly."* Another player, P3 explained that it was a personalized app with the phrase: *"... My own profile appears directly without selecting it when I log in to the profile. I don't have to do anything to choose myself in the profile section anyway".*

Competitor analysis and literature analysis during the planning phase of the application guided to compare the performances of the players with themselves and their peers and to set goals for their individual performances. Furthermore, the norms developed during the planning phase of the application were added to the "set a goal" feature, considering that they would support the players' goal-setting. In this context, "compare with me" and "set a goal" pages were created during the development phase. However, players preferred to use other stats instead of using norms and they tended to use previously familiar statistics rather than norms that are new to them. In other words, while the improvement phase findings show that the players use the "compare with me" feature comfortably; showed that there is a need for improvements in the "set a goal"

feature. In line with this, one of the players, P1 explained that for the “compare with me” feature with this phrase: *“...compare with me. In other words, after choosing the player directly, there was a compare with me section. I click it now. There is what we both did in the same season. It says how many minutes we played, how many rebounds we took, and how many scores we made in the game. All of them are written here, sir. I can directly compare myself with using all of them.”*

Another player, P2 stated that for the “compare with me” feature: *“...I think he was an important player for our team that year. I choose Mahmut Can. I compared Mahmut Can with myself. Here, the statistics of both players have been presented. Minutes played and scores, these are important statistics for us.”*

P1 stated that for the “set a goal” feature: *“...When I click from the top of the left, my goals section appeared. Season goal. Here I can create a new goal for myself. I can write the goal type myself. It shows a season goal, a match goal, and a performance goal.”*

P3 offered that for the “set a goal” feature: *“...and goal-setting page...it would be better to see the descriptions of my goal there after I save my goal...”*

The norms which were developed during the planning phase of the application were used as badges and leaderboards in the context of gamification during the development of the application. The improvement phase findings showed that norms should be emphasized more in design. Therefore, infoboxes were added to the acronyms for all stats and norms. In line with this, one of the players, P3 explained that with this phrase: *“...let me tell you this way, I think it's a good thing that when we click the button and it immediately shows statistics. I even click it again and it is presented directly. I think it's a nice thing (performance). As I said, even a person who does not know basketball can understand this quite clearly.”*

In summary, mixed methods integrative results showed how quantitative and qualitative findings are combined in the mobile application development process.

Chapter 4 presented all quan and qual findings of three DBR phases used in this research. Chapter 5 presents the sections of discussion, conclusion, and recommendations for future research.

5. DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

In this last chapter, there are (i) discussion, (ii) conclusion, and (iii) recommendations related to developing a mobile application for youth basketball players.

5.1. Discussion

This research aimed to develop a mobile app in three phases, combined norm development research and user experience research under the umbrella of design-based research methodology. The discussion section was presented according to the research questions in the planning, developing, and improving phases of DBR used in this research.

5.1.1. First phase: Planning the design

Design-based research (DBR) has a context-focused, theory-based, integrative, interactive, and pragmatic process (Wang and Hannafin, 2005). Therefore, in order to develop the application in accordance with the theory-based nature of the research method, the first research question was: *What is the conceptual and theoretical framework needed to develop a mobile app?* This conceptual and theoretical framework that reflects the purpose of the application consists of team development linear theory, goal setting theory, cognitive evaluation theory, social comparison theory, intrinsic motivation, Fogg behavior model, gamification, basketball statistics, and WEB 2.0 applications.

Based on the team concept and the team development linear theory (Weinberg and Gould, 2010), team norms and roles were included in the design. Therefore, it was decided the app design included basketball-specific norms and roles to guide players on what they are supposed to do and what not to do for team cohesion. For example, in basketball, point guard, forward, and center positions are official roles, and they each have distinct responsibilities on a team. Each role has its own set of requirements. Individuals are typically hired or trained to fill specific responsibilities. It is highlighted in the sports literature, for players, it is important to understand their roles, to fulfill their responsibilities of the role (Beauchamp et al., 2005). These basketball-specific norms are called productivity norms (Munroe et al., 1999) in sports literature developed

by efficiency score-based. Therefore, they were called efficiency norms in this research and used in the mobile app. Furthermore, it is expected that the application will contribute to the emergence of four stages (forming stage, storming stage, norming stage, and performing stage) of the team development linear theory (Weinberg and Gould, 2010).

Based on the social comparison theory (Festinger, 1954), the performance comparison feature was added to the mobile app for players' self-determination. In this context, players will be able to compare with players with similar performance, with players with lower performance than themselves, and with players with higher performance than themselves. In terms of social comparison theory literature, players can make horizontal social comparisons, upward social comparisons, and downward social comparisons (Festinger, 1954). In addition, the findings regarding the visualization of learning (Brusilovsky et al., 2016) guided the visualization of the team averages. Therefore, it was decided to present player and team performances in the same visual component so that users can easily compare them.

Based on the goal-setting theory (Locke and Latham, 2013), it was decided to goal-setting feature was included in the design. Players will be able to set performance goals, short-term goals, long-term goals, individual goals, and competition goals except for outcome goals, team goals, and process goals using this feature (Burton and Raedeke, 2008; Locke and Latham, 2013; Weinberg and Gould, 2010). In order for the goals to be appropriate SMARTS acronym (H. W. Smith, 1994; Weinberg and Gould, 2010), efficiency norms were developed for the players. Since efficiency norms classify players according to their performance, players can compare their performance with similar performance. In this way, it is also possible to set self-determined, specific, and challenging goals, and avoid to hard-to-reach goals. As a result of this design, players will have the opportunity to set special, measurable, action-oriented, realistic, timely, and self-determined goals.

The cognitive evaluation theory (CET) was developed to explain the variability in intrinsic motivation (Deci and Ryan, 1985). The CET assumes that reward distribution, feedback, reinforcement, and conditions that affect people's perception of efficacy and sense of self-determination will also affect their intrinsic motivation. Furthermore,

gamification in sports applications review paper (Tóth and Lógó, 2018) shows that gamification is the least influencing factor in the preference of the application, but is the most positive factor in the use of applications. Therefore, based on cognitive evaluation theory (CET), the Fogg behavior model (Fogg, 2021), intrinsic motivation (Weinberg and Gould, 2010), and gamification concept (http-10), it was decided to notifications should be included in the design with basic gamification elements (Yilmaz, 2015). These performance notifications (basketball performance feedback) help players get motivated and take action. As a result of this, Fogg behavior model cycle may be repeated in order and basketball-specific behaviors may change in the desired direction. Moreover, feedback elements that are essential for goal setting are not ignored in this decision (Burton and Raedeke, 2008; Locke and Latham, 2013; Weinberg and Gould, 2010; Widmeyer and Ducharme, 1997). Because, even before mobile technologies support performance tracking, the match performances of the players were tracked with the logbooks (Table 2.3) (Burton and Raedeke, 2008) and sheets (Table 2.4) (Karageorghis and Terry, 2011) and rewarded with badges (Kazak, 2015).

In the education literature, Kokoç and Hayıt (2020) develop a learning analytic panel called MobilAnalitik. This panel was aimed at students to track their activities, receive feedback, and set goals in their online learning environment. They utilized two theories to design their panel. These were Social Comparison Theory (Festinger, 1954) and Self-Regulated Learning Model by Winne and Hadwin (Panadero, 2017). The self-regulated learning theory by Winne and Hadwin has four phases: (i) task definition, (ii) goal setting and planning, (iii) enacting study tactics and strategies, and (iv) metacognitively adapting studying (Panadero, 2017). In this research, while it was utilized the social comparison theory used by Kokoç and Hayıt in their MobilAnalitik design; cognitive evaluation theory and goal setting theory developed for sports environments were used instead of the self-regulated learning theory they used in their panel. Although the theories have similar structures, self-regulated learning theory focuses on learning behavior and performance; others focus on sports performance. Since this research aims to develop an application for sports environments, it has benefited from theories in sports contexts.

In sports literature, Connell and Spencer (2020) develop a player effectiveness analysis system using an action design research (ADR) approach. This ADR approach

followed a protocol (the structure of problem formulation (position and match specific), objective solutions, design and development, demonstration, reflection and learning, and formulation of learning). This effectiveness analysis system was aimed at players on the technical, tactical, and physical aspects of performance in an elite football performance environment. The findings of this study showed that creating an effective and shared playing analysis system increases relevancy in the communication levels and understanding of both coaches and players. DBR method in this research, which is similar to the ADR method in this study, has an iterative structure. This iterative advantage of these methods helped better results for the developed products in these works.

As cited above, DBR is context-focused research (Wang and Hannafin, 2005). Therefore, it is significant to understand the context. Besides that, this DBR has used user-centered design (UCD) (Huang et al., 2019). UCD needs to understand and specify the context of use like DBR and identify user and organization requirements. Therefore, in order to develop the application in accordance with the context-focused nature and user-centered design, the second research question was: *What are the digital characteristics of the mobile app target audience?* The document analysis was used to address this research question and the “Digital 2023: Turkey” report (Kemp, 2023) was analyzed. In other words, in the planning phase, as it was planned as an application with a user-centered design, digital characteristics, demographic, and performance data of young male basketball players of BYL were used.

According to the report (Kemp, 2023), some of the main reasons for using the Internet by individuals 16-64 age: finding information (73.2%), keeping up-to-date with news and events (67.6%), staying in touch with friends and family (58.3%), and education and study-related purposes (49.5%). Some of the main reasons for using social media are as follows: keeping in touch with friends and family (50.1%), watching or following sports (26.0%), posting about your life (24.7%), and work-related networking or research (24.3%). Some of the types of social media accounts followed are as follows: friends, family, and people you know (42.4%), sportspeople and teams (23.6%), and contacts relevant to work (18.7%). Özsarı and Saykılı (2020) expressed that users defined mobile learning as time and place-independent, easy, fun, flexible, engaging, portable, and engaging. Furthermore, they highlighted many “digital native”

users prefer mobile learning because of these characteristics of mobile learning in Türkiye. Considering the target audience characteristics associated with the research purpose written above, it was decided that designing the mobile application called Stats&Goals as a WEB 2.0 mobile application would be more suitable for the preferences and trends of the individuals. In addition to digital statistics of target users, WEB 2.0 applications were decided by taking into account technological aspects (user-centered, collaborative, communicative, interactive, cost-effective, participatory, and scalable). Data on operating systems in the report (Kemp, 2023) showed that the application should be compatible with Android and iOS operating systems.

The third research question was questioned for conducting this DBR with its context-focused nature (Wang and Hannafin, 2005) and user-centered design (UCD) (Huang et al., 2019), like the previous research question. Therefore, in order to develop the application in accordance with the context-focused nature and user-centered design, the third research question was: *What are the norms which are developed as goals for young players?* To address this research question, ten steps were followed both in the norm development process based on group values and in the rank-based norm development process (Erkuş and Selvi, 2019). In other words, in the planning phase, based on the performance data of the players, norm development analyses were made for efficiency scores. And, norms were developed based on group values and ranking during this process (Erkuş and Selvi, 2019). Positive names were given to the developed norms, taking into account the achievements of the players in the seasons and the positive feedback literature (Kağan, 2015; Mouratidis et al., 2008; Vallerand and Reid, 1984). The names of norms based on group values were: MVP Candidates, All-Stars, Stars, Average Players, and Rotation Players. One of the experts emphasized that the stars norm has a very wide range in the consistency process of norm development. According to Z scores nature, the largest range in the norm development process is the ± 1 range. This makes stars norm range wider than other norm ranges. This evaluation showed that the experts were careful in the consistency process, and an alternative evaluation would also support the motivation of the players. Taking into account the expert opinions for consistency during the norm development process, the percentages based on ranking also were named in order to help players' motivation. Therefore, the "National Player Candidates" name were given to the 50 and more percentages, taking

into account the achievements of the players in the seasons. In other words, the norms were named according to the achievements of the players. For example, all MVPs were in the (+2)-(+3) norm (http-18). That's why this group was named MVP candidates. Or, players on the fifty percentages were selected for the youth national teams (http-19; http-20). Therefore, the ones that classified fifty percent and more were named national player candidates. These names were designed as badges on the app, taking into account the gamification literature (Yilmaz, 2015).

Sports norm development studies in Türkiye were carried out in the context of talent selection in athletics (Bayraktar et al., 2010) and wrestling (Bayraktar et al., 2011) sports. Therefore, these studies were conducted with anthropometric (height, weight, and BMI) and motoric tests (vertical jump, right-hand grip, left-hand grip, standing long jump, standing medicine ball throwing, flexibility, etc.) data. While developing the norms for boys and girls aged 10-12 and boys aged 13-17 in the norm-developing study conducted in athletics; in the norm-developing study conducted in wrestling, 12-18 age male norms were developed. While developing the norms for boys and girls aged 10-12 and boys aged 13-17 in the norm-developing study conducted in athletics; in the norm-developing study conducted in wrestling, 12-18 age male norms were developed. In addition, in the athletics norm study, norms were developed for men aged 13-17 for short distance, middle and long distance, jumping, and throwing branches. While the 10-12 age norm classification was made over four norms (low, normal, high, and very high); the 12-18 and 13-17 age norm classification was made over five norms (low, below average, average, above average, and very high). In these studies, it is stated that the Canadian standard was used while the norm was developed over five norms for male athletes aged 12-18 and 13-17. This approach is similar to the rank-based norm development process (Erkuş and Selvi, 2019) used in this research. Limits are reported for each 10 percent. And each 20 percent was named as low, below average, average, above average, and very high. In this research, besides rank-based norm development, the norm development process based on group values was also used (Erkuş and Selvi, 2019). The norms in this research were developed for players to use in goal setting. Although the norms developed in this research are not the norms of motoric and anthropometric data; these studies (Bayraktar et al., 2010, 2011) remind that the norms developed for male basketball players in this research can also be used in the final stage

of talent selection. Because, at the final stage of talent selection, general and specific sportive efficiency are also examined. In addition, the resumes of athletes who perform efficiently or get good outcomes in competitions are evaluated under the name of being sportively skilled (Bayraktar et al., 2010). In Germany, talented players are selected for inclusion in the support programs based on their performance in sport motor ability, skill tests, and current competition performance and outcomes (Güllich, 2013). As a matter of fact, the players selected for the national teams ([http-19](#); [http-20](#)) inspired the naming made according to the percentages.

In basketball, it is grouped players' performances according to John Hollinger's efficiency ratio (player efficiency ratio (PER)) ([http-12](#)). There are 13 groups (norms) according to the John Hollinger efficiency score for NBA. These groups are named: all-time great season, runaway MVP candidate, strong MVP candidate, weak MVP candidate, definite all-star, borderline all-star, second offensive option, third offensive option, slightly above-average player, rotation player, non-rotation player, fringe roster player, and player who won't stick in the league. While naming the norm groups in this research, this grouping in the basketball literature was also used together with the players' achievements in the seasons.

Design-based research is a context-focused research method (Wang and Hannafin, 2005). Therefore, the fourth research question was: *What are the functions of similar apps to the mobile app?* To address this research question, websites were reviewed and quantitative content analysis is utilized. In other words, the most popular apps (TBF App and InStat Basketball Scout App) with similar functions in Türkiye were compared with competitor analysis to identify the technologies that target users favored as well as those used in apps with similar functions at the planning stage in terms of general characteristics.

In competitor analysis, general features of the TBF App and TBF's BYL news (announcements) were analyzed (Table 4.10, Table 4.11, and Table 4.12). As a result of this analysis, it was found that TBF not only shares announcements in the news but also uses some gamification elements for individuals and teams. For example, in the 2017-2018 ([http-21](#)), 2018-2019 ([http-22](#)), and 2019-2020 ([http-23](#)) seasons, the top ten players with the highest average points, total rebounds, and assists were announced in

the list of points, total rebounds, and assist kingdoms. In addition, it was found that the stars of the week were announced in the same seasons ([http-24](#); [http-25](#); [http-26](#)). However, it was found that the most valuable player (MVP) was declared only once through these five seasons ([http-18](#)). In the 2020-2021 season ([Http-27](#)), it was found that the top (best) five (best five means best team) and statistical leaders were announced. In addition, players who competed in the 2020-2021 season were given an online certificate ([http-28](#)). As an example of gamification in teams, announcing the teams that will play the final or announcing the champion teams can be given ([http-29](#)).

TBF app, which is a WEB 1.0 application, has responsive design and gamification elements and helps to present and compare player performances. Instat Basketball Scout App, which is a customizable WEB 2.0 application, has a responsive design and helps to present and compare player performances. Furthermore, while Instat Basketball Scout App has a video analysis feature, it lacks gamification elements. And, both TBF and Instat Basketball Scout App lack goal-setting components (Table 4.12).

Data on the operating systems of these apps showed that the Stats&Goals should be responsive app and compatible with Android and iOS operating systems. In addition, competitor analysis showed that Stats&Goals should be a WEB 2.0 app that helps players track match performance statistics, set performance goals individually, and compare their performance with themselves and their peers. Furthermore, competitor analysis showed that similar TBF platform include gamification elements (points, badges, and leaderboards), although not regularly. It was found that the announcements and gamification components are not similar and are shared irregularly in the content analysis (Table 4.10 and Table 4.11). However, considering the nature of gamification and motivation (Yilmaz, 2015), it is obvious that such motivational elements should be used regularly. Therefore, it was decided to gamification elements should be included and utilized regularly in the Stats&Goals. Considering the costs, the lack of a video analytics feature in the app was deemed appropriate.

Design-based research is an interactive research method (Wang and Hannafin, 2005) and guides collaboration between researchers and stakeholders (Design-Based Research Collective, 2003). It is based on collaboration among researchers and practitioners in real-world settings (Wang and Hannafin, 2005). Therefore, the fifth

research question was: *What are the developers' opinions on app design?* To address this research question, interviews were utilized with developers. In these interviews, the findings of the literature analysis, user analysis, norm analysis, and competitor analysis were shared with the software developer. Furthermore, the name and logo of the app were discussed in two interviews and the name and logo were selected by the researcher, dissertation adviser, and the software developer. At the end of these interviews, the developer has planned which components and technologies the players need in the application and started the developing phase.

5.1.2. Second phase: Developing the design

Design-based research (DBR) is characterized as a process that is systematic but adaptable that aims to enhance educational practices through iterative analysis, design, development, and application of new concepts (Wang and Hannafin, 2005). In other words, DBR is an iterative and pragmatic research method and it leads to theoretical and practical knowledge production with iterations. In order to develop the application in accordance with the iterative and pragmatic nature of the DBR, the first design development research question was: *What are the technologies used to develop the mobile app?* To address this research question, information from the developer was presented as app development frameworks and programming languages, designing drafts for the app interface, database technologies, and the operation of the application infrastructure.

Flutter was used to run the application as a mobile application running on both Android and iOS operating systems mobile phones. Flutter helps to develop a responsive mobile app design for different screen sizes and operating systems with a single code base (http-30). Time and financial loss for native apps to be spent developing applications for two different platforms were avoided because of Flutter. Laravel framework was used in the backend that provides API services. REST API architecture was used to enable the application developed with Flutter to communicate with the database. REST architecture was used in the development of the API service of the mobile app. REST is an architectural model that enables data exchange between Server and Client (http-31). Furthermore, it is an architectural structure that works on standard HTTP (The Hypertext Transfer Protocol). Database tables are designed for

storing data. The migrations feature in Laravel was used to create database tables. Migrations is a database version control system of Laravel. New schemes can be added and edited via the command line. It can perform database-related transactions without using the database management system ([http-32](#)).

Kokoç and Hayit (2020) used Apache Cordova Framework and standard web technologies (HTML5, CSS3, and Javascript) in the learning analytics panel called MobilAnalitik. App development technologies differed according to the purpose of the application in the literature. However, it seems hybrid app technologies were popular in development processes for being time and cost-friendly.

5.1.3. Third phase: Improving the design

Design-based research is an iterative and context-focused research method (Wang and Hannafin, 2005). In order to improve the application in accordance with the context-focused nature of the DBR, the design improvement research question was: *What are the mobile app opinions and experiences of the players?* A qualitative usability test was used to address this research question in the improvement phase of the research.

Different data collection techniques such as questionnaires (İşcan, 2020), semi-structured interviews (Kokoç and Hayit, 2020), and scales (Orhan Göksün et al., 2018) were used in the improvement phases of the studies. In this research, a qualitative usability test which is one of the frequently used qualitative UX research methods (Türk, 2023) was preferred to learn the opinions and experiences of the players about the first prototype of the application. Usability testing which shows you whether the developed/to be developed product can be used or not by users ([http-13](#)), is often used to uncover problems in app design, detect improvements, or uncover features that can be added (Cirucci and Pruchniewska, 2022).

As a result of the content analysis of this test, the themes were WEB 2.0 app, user-friendly app, personalized app, customized app, notification, indirect advantages, and suggestions. Some of these themes show that Stats&Goals complies with the functional suitability and usability features of the SO/IEC 25010 software product quality ([http-33](#)). All the software product quality features are functional suitability

(functional completeness, functional correctness, and functional appropriateness), performance efficiency (time behavior, resource utilization, and capacity), compatibility (co-existence and interoperability), usability (appropriateness recognizability, learnability, operability, user error protection, user interface aesthetics, and accessibility), reliability (maturity, availability, fault tolerance, and recoverability), security (confidentiality, integrity, non-repudiation, authenticity, and accountability), maintainability (modularity, reusability, analysability, modifiability, and testability), and portability (adaptability, installability, and replaceability).

5.1.4. Mixed methods integrative results

Design-based research (DBR) has a context-focused, theory-based, integrative, interactive, and pragmatic process (Wang and Hannafin, 2005). Therefore, in order to develop the application in accordance with the integrative and interactive nature of the research method, the mixed methods integration research question was: *How do participants' opinions and experiences on the mobile application contribute to the products of the norm and app development processes?* The mixed methods integrative analysis was used to address this research question.

The mixed methods integrative results showed that the players are divided into five norms, norm development has consistency according to the experts' opinions, and these norm ranges were named "MVP Candidates", "All-Stars", "Stars", "Average Players", and "Rotation Players", and utilized as badges in the mobile app design. Furthermore, these results also showed the contribution of the quantitative and qualitative analysis in the planning phase to the development phase of the design. Qualitative findings (the opinions and experiences of the youth players) supported the results of the quantitative analysis and provided guidance for the improvement phase of the design. Furthermore, these results showed that qualitative usability testing combined with survey questions allowed extensive data collection on players' experiences and opinions during the improvement phase. Overall, while the findings of the planning phase helped drive the development phase; both the findings in the planning and development phases helped to carry out the improvement phase. The mixed methods integrated findings also showed that hybrid applications with user-centered design should be developed for the niche groups like this research sample.

5.2. Conclusion

This dissertation, which aims to develop a mobile application, was design-based research with a user-centered design. The design-based research methodology in this dissertation had three phases (planning the design, developing the design, and improving the design) utilized for this purpose.

Design-based research is a pragmatic research method (Wang and Hannafin, 2005) and it leads the knowledge production that can help theoretical and practical for the designers (Design-Based Research Collective, 2003). In this context, at the end of this user-centered design-based research, a mobile application called Stats&Goals was developed for improving youth basketball performance (Image 5.1). Stats&Goals will help players track match performance statistics, set performance goals individually, and compare their performance with themselves and their peers. Opportunities of Stats&Goals:

- Tracking performance statistics,
- Players' and teams' profiles,
- Personalized players' norms,
- Compare feature for players,
- Goal-setting feature for players,
- Gamification.



Image 5.1. *Stats&Goals QR code*

Design-based research (DBR) leads to knowledge production including contextually-sensitive design principles and theories that can help theoretically and practically for the designers at the end of the process (Design-Based Research Collective, 2003; Wang and Hannafin, 2005). In this context, a protocol was developed and proposed for researchers who will develop similar applications as a result of this research (Figure 5.1).

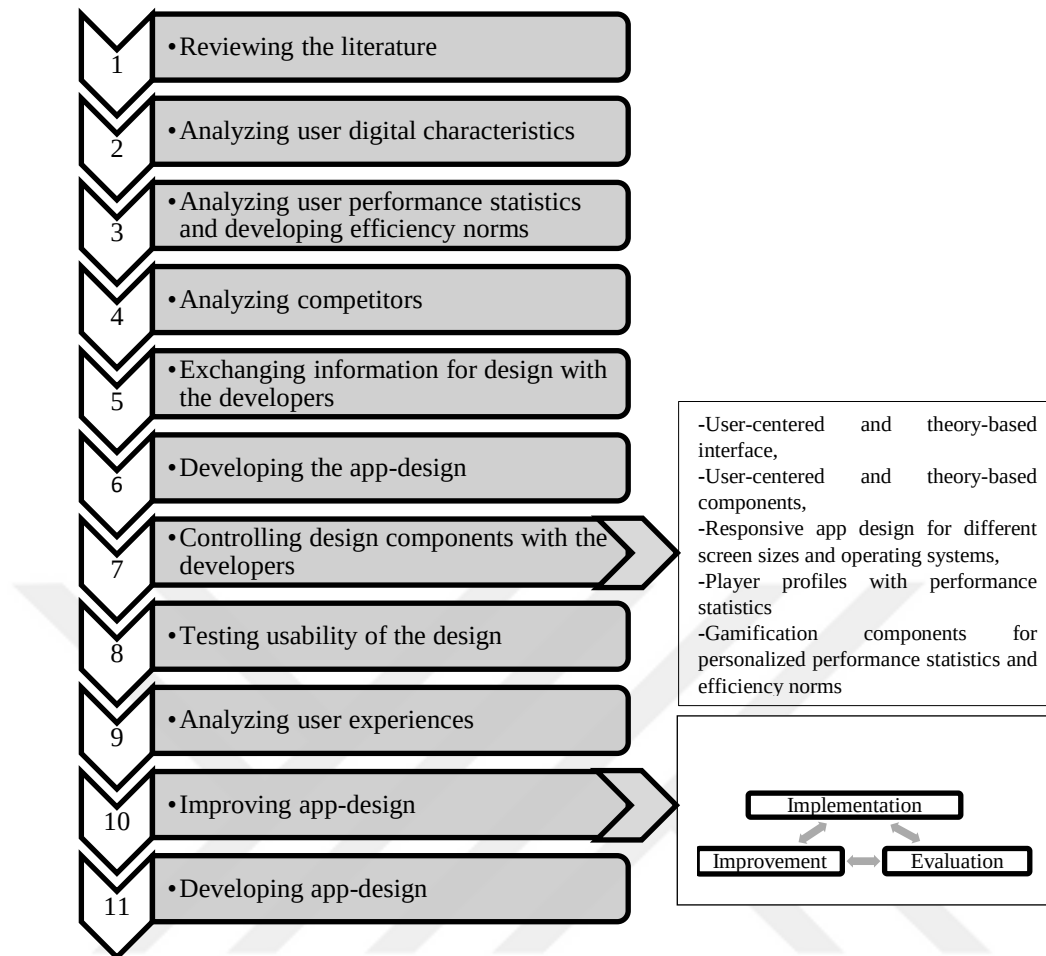


Figure 5.1. *Mobile app developing protocol*

Furthermore, this DBR used a user-centered design (UCD) (Huang et al., 2019). Huang et al. (2019) conceptualized two design types in their book: user-centered design and learner-centered design. And, although the DBR methodology has many principles, each DBR is unique and has its own structure (Design-Based Research Collective, 2003). In this context, this DBR was named user-centered design-based research and conceptualized.

This research has 4 limitations. First, five BYL seasons' data were only used for norm development. During these five seasons, some issues that may affect player stats were taken. To minimize the effect of these differences on norm development, player statistics were divided by the number of matches.

Second, the efficiency score used by TBF was adopted in the research. This efficiency score was assumed adequately explains player statistics. The efficiency

scores used in the literature are limited while reflecting the performance in the field. Although some studies suggest separate formulas for both offensive and defensive performance, it cannot be said that they have no limitations. Because the statistics published as basketball statistics mostly record the movements of the players with the ball (Points, Assists, Rebounds, Block, and Turnover) or illegal movements (Foul). However, it does not record many defense movements (such as help and recover, deny the ball, etc.). Therefore, players who play a defensive style have lower efficiency than players who play an attacking style. In other words, although they contribute a lot to the performance and winning of the team, they cannot contribute enough to their own statistical performance individually and they are not as visible as other players. Just as a commonly used and known formula such as BMI evaluates muscular individuals as obese individuals, it is also difficult to evaluate the efficiency of players who is good in defense. Just as a commonly used formula such as BMI evaluates muscular individuals as obese individuals, the efficiency score formula also has difficulty evaluating players who are good at defense. In other words, it should be noted that formulas that try to evaluate more than one variable in a single score have limitations.

Third, players were selected with nested sampling for their app experiences. So, it is not known the effect athlete opinion differences exist on the design of the app.

Fourth, the researcher tried to collect the position data of the players. However, while some players declared a single position (PG, SG, SF, PF, C) for their positions, as expected; some players declared dual positions (PG-SG, SG-SF, SF-PF, PF-C) for their positions. This did not allow to make comparisons for these five positions. Therefore, it was decided to collect the players' positions while the players download the app and fill their personal data. However, this decision prevented the development of norms for player positions.

In other words, the generalizability of the developed app was limited to the context of this research, players' data on the TBF official website, and the views and experiences of players and coaches who participated in the research.

5.3. Recommendations

Stats&Goals is an application that includes performance goals, competition goals, short-term goals, long-term goals, and individual goals. However, it is not an application that covers outcome goals, team goals, and process goals. Applications that include these features as well as process goals, outcome goals, and team goals may be the subject of further research. In terms of process goals, an application with a library of player videos showing players' performance in the match is suggested. In other words, it should have a user-specific video analysis feature like InStat Basketball Scout App. It should not be forgotten that more multidisciplinary researchers and more budget are needed to develop such applications. In terms of outcome goals and team goals, it is recommended to identify the features that distinguish better-performing or more successful teams from others and to have components that allow coaches to use the application specific to teams.

While developing Stats&Goals, only the young male players' performance statistics were used and norms and percentages were developed by season and age for young male ones. Therefore, researchers may focus to develop apps that have the norms of the players according to their positions in further research. These apps will be useful to learn team roles in team building literature. In addition, in terms of social comparison theory, comparisons by position will help players more in setting goals and learning team roles. Furthermore, apps covering young female players in BYL and all players in other leagues in Türkiye will contribute more to Turkish basketball in terms of widespread impact.

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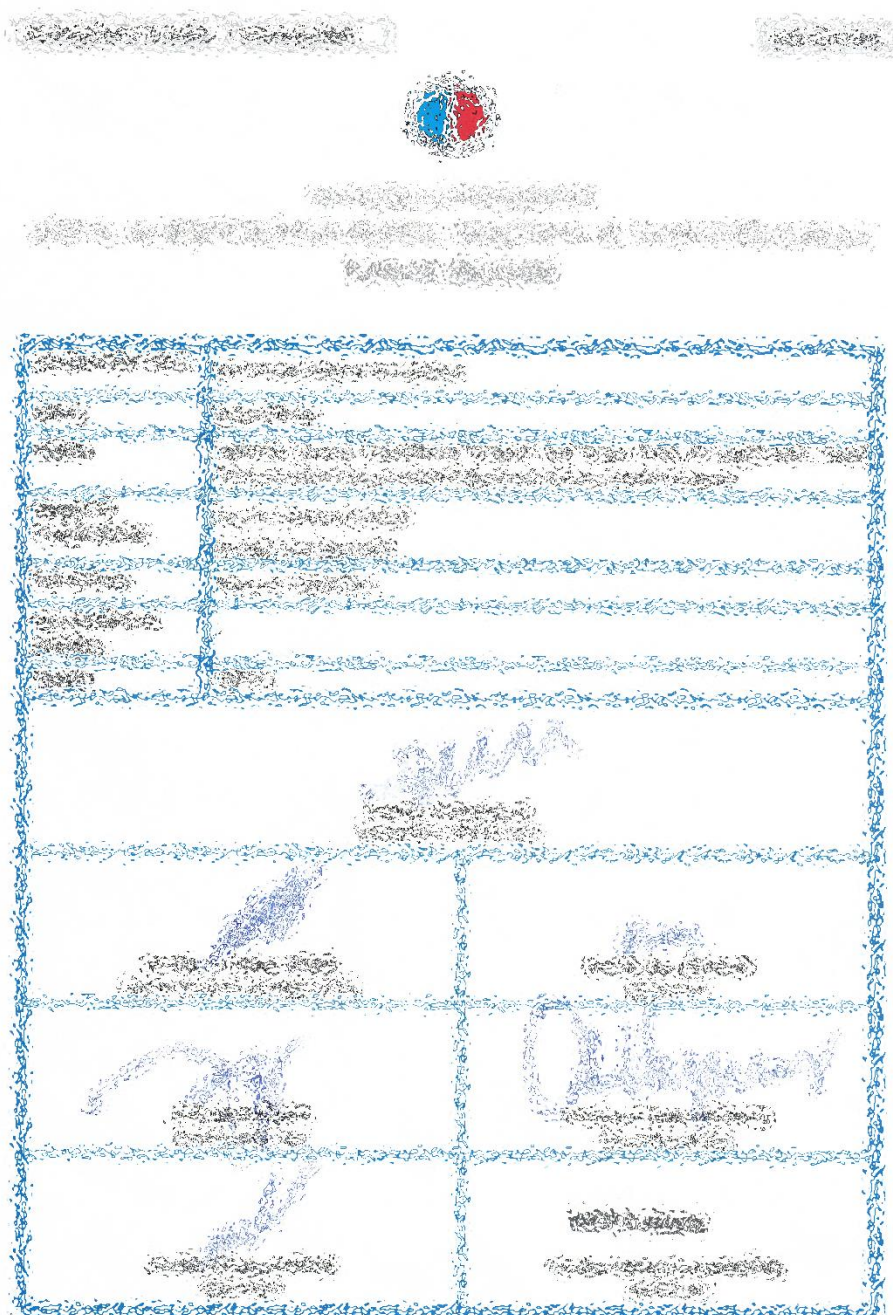
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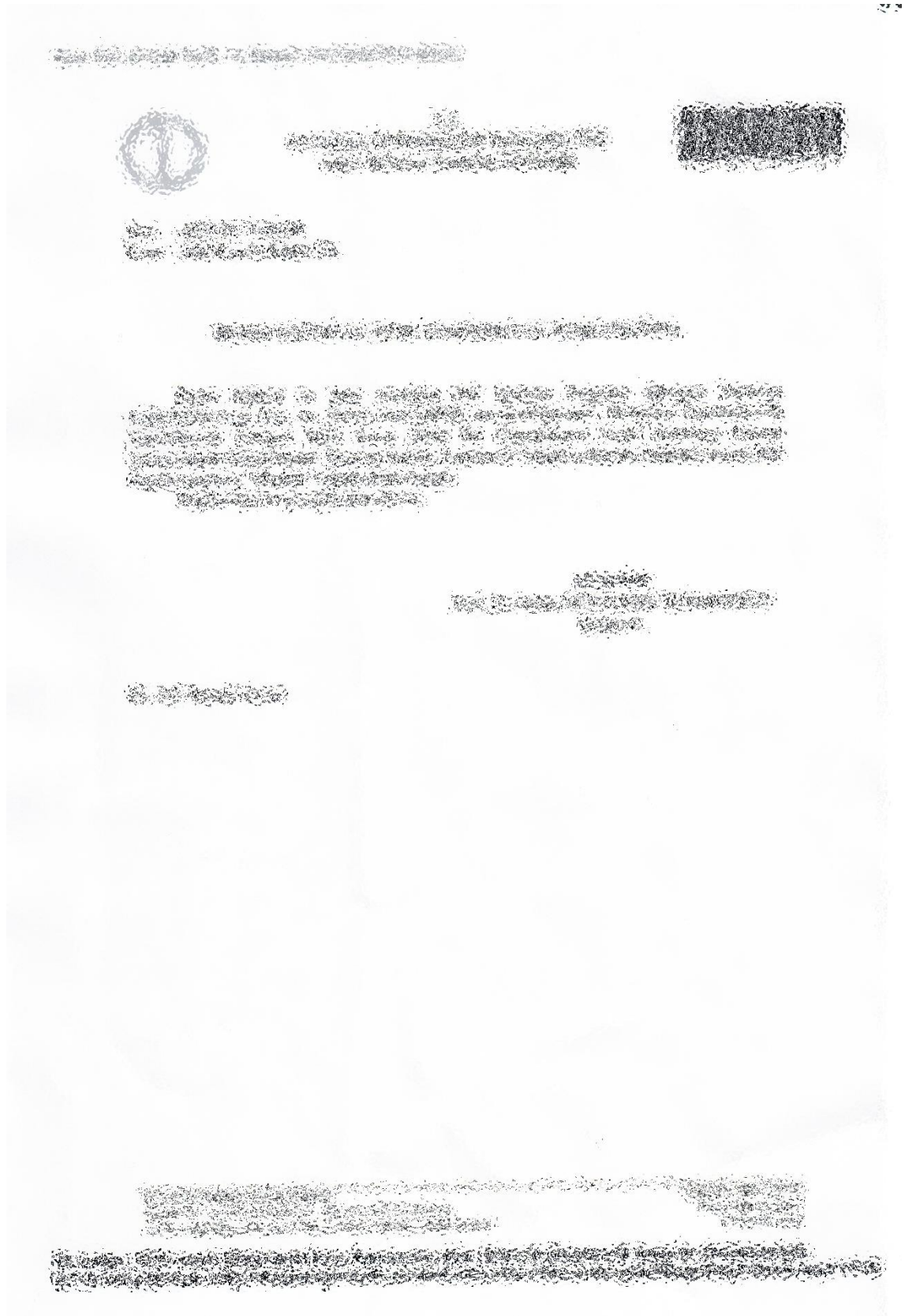
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APPENDICES

APPENDIX-1. Approval of Ethic Committee 1



APPENDIX-2. Approval of Ethic Committee 2



1. The first part of the document is a header section containing the title and author information.

2. The second part is the main body of the text, which is divided into several paragraphs.

3. The third part is a conclusion section, which summarizes the findings of the study.

4. The fourth part is a list of references, which includes the sources used in the research.

5. The fifth part is an appendix, which contains additional information related to the study.

6. The sixth part is a glossary, which defines the key terms used in the document.

7. The seventh part is a bibliography, which lists the works cited in the text.

8. The eighth part is a list of figures and tables, which provides a visual representation of the data.

9. The ninth part is a list of footnotes, which provides additional information on specific points raised in the text.

10. The tenth part is a list of appendices, which provides additional information on specific topics related to the study.

APPENDIX-4. Qualitative Usability Test Participant Consent Form

Kurum: Anadolu Üniversitesi Sağlık Bilimleri Enstitüsü Beden Eğitimi ve Spor Doktora Programı

Araştırmacı: Araş. Gör. Ramazan TAŞÇIOĞLU

Danışman: Prof. Dr. Serdar KOCAEKŞİ

İkinci Danışman: Doç. Dr. İlker USTA

Anadolu Üniversitesi Doktora Tez Proje Numarası: 2009E096

Doktora Tez Başlığı: Basketbol Oyuncu İstatistiklerini Kategori Bazlı Sunan Mobil Bir Uygulamanın Hedef Belirleme Kuramı Çerçevesinde Geliştirilmesi: Tasarım Tabanlı Araştırma

Sayın katılımcı,

Öncelikle hem **Türkiye Basketbol Federasyonu (No: 2019/0939)** iznine hem de **Anadolu Üniversitesi Etik Kurulu (No: 68215917-050.99)** iznine sahip araştırmamıza katıldığınız için çok teşekkür ederim. Katılımınız bizim için çok değerli. Bu form yazılı izniniz almak ve sizi araştırmanın amacı ve içeriğiyle ilgili bilgilendirmek için hazırlanmıştır. İzninizle sizi bu araştırma kapsamında bilgilendirmek istiyorum.

Araştırmayı kim yürütüyor?

Bu doktora tezi, Anadolu Üniversitesi Beden Eğitimi ve Spor Doktora Programı Araştırma Görevlisi Ramazan TAŞÇIOĞLU tarafından Prof. Dr. Serdar KOCAEKŞİ danışmanlığında yürütülmektedir. Araştırma ekibinde, farklı aşamalarda başka kişiler de görev alabilirler.

Araştırmanın amacı nedir?

Araştırmanın genel amacı, genç basketbolcular için bir oyuncu verimliliği uygulaması geliştirmektir.

Araştırmada kimler yer alacaktır?

Araştırmada dolaylı olarak tüm Basketbol Gençler Ligi (BGL) oyuncuları yer almaktadır. Araştırmanın ilk aşamasında tüm oyuncuların basketbol istatistik verilerinden yararlanılmış ve uygulama için bir prototip geliştirilmiştir. Araştırmanın bu aşamasında prototipin kullanılabilirlik testlerine 5-10 arasında oyuncu katılacaktır. Siz bu araştırmaya katılıyorsunuz çünkü araştırmayı kullanacak potansiyel kullanıcılar arasındasınız.

Araştırmada ne yapmanız bekleniyor ve ne kadar sürecek?

Sizden geliştirilecek uygulamaya dair görüşlerinizi ve deneyimlerinizi paylaşmanız beklenmektedir. Bu kapsamda sizlerden uygulamayı kullanmanız ve uygulamanın tasarımı ve fonksiyonları hakkında sorulara cevaplar vermeniz beklenmektedir. Yanıtlarınız araştırma verilerinin geçerliğini sağlamak ve veri kaybını önlemek için kayıt altına alınacak ve sadece araştırma kapsamında kullanılacaktır. Görüşme, yaklaşık olarak 45-60 dk. sürecektir. Katılımcılar, isterlerse görüşmelere dair geri bildirim verebilirler (Tahmini ek süre 30 dk.).

Araştırmaya katılmanın herhangi bir riski var mı?

Bu aşamada sorulacak sorularda herhangi bir fiziksel, psikolojik, sosyal, yasal ve ekonomik risk öngörülmemektedir. Yapılacak olan görüşmede kimlik bilgilerinizi ifşa edecek veya size hak kaybı yaratacak hiçbir girişim olmayacaktır. Görüşme öncesi ve sırasında toplanacak veriler gizli tutulacak ve sadece araştırmacı tarafından değerlendirilecektir. Elde edilecek bilgiler sadece bilimsel yayınlarda kullanılacaktır. Bilimsel yayın süreçlerinden sonra en az 2 yıl daha saklanacaktır. Gizlilik ihlali riskini azaltmak için: (1) katılımcıların isimleri yerine formlar üzerinde kod adı ve numara olacak, (2) araştırma verileri şifreli bilgisayarda saklanacaktır.

Araştırmaya katılmanın size bir faydası var mı?

Araştırmaya katıldığınız takdirde, genç basketbol oyuncuları için geliştirilen bir mobil uygulamanın ilk sahiplerinden biri olacaksınız. Buna ek olarak, uygulamanın görüşleriniz ve deneyimleriniz sonucunda geliştirilmesine katkıda bulunup ihtiyaçlarınıza özel gibi bir uygulamaya sahip olma şansı yakalayacaksınız.

Araştırmaya katılmak istemiyorum. Ne yapmalıyım?

Görüşme öncesi ve sırasında sorulacak olan sorular, genel olarak kişisel rahatsızlık verecek soruları içermemektedir. Ancak, katılım sırasında sorulardan ya da herhangi başka bir nedenden ötürü kendinizi rahatsız hissederseniz cevaplama işini yarıda bırakıp çıkmakta serbestsiniz. Görüşmelerin kayıt altına alınmasını istemiyorsanız araştırmaya katılmamayı tercih edebilirsiniz. Katılımınız, gönüllülük temelinde olmalıdır.

Araştırma hakkında görüş, öneri ve sorum varsa ne yapmalıyım?

Araştırma hakkında her türlü görüş, öneri ve sorularınız için Araştırma Görevlisi Ramazan Taşcıoğlu ile (e-posta: ramazantascioglu@anadolu.edu.tr) ile iletişim kurabilirsiniz.

Antlaşma:

Bu formun tamamını okudum ve tüm sorularıma yanıt aldım. Bu formu imzalayarak araştırmaya gönüllü olarak katıldığımı ve istediğim zaman yarıda kesip çıkabileceğimi onaylıyorum. Bu onay, bu araştırmaya katılmaya karar verdiğimi, tüm bilgileri okuduğumu ve anladığımı doğrular. Verdiğim bilgilerin kayıt altına alınmasını ve bilimsel amaçlı yayımlarda kullanılmasını kabul ediyorum.

Görüşmenin kayıt altına alınmasına onay veriyorum.

Evet ise

İmza _____

Yukarıda Belirtilen Şartlar Taraflarca Kabul Edilmiştir.

Katılımcı Ad Soyadı

Tarih

İmza

---/---/---

Araştırmacı Ad Soyadı

Tarih

İmza

---/---/---

APPENDIX-5. Qualitative Usability Test

“Sayın katılımcı,

Öncelikle araştırmamıza katıldığınız için teşekkür ederim. Adım Ramazan Taşçıoğlu ve bugün bu oturumda size moderatörlük yapacağım.

[*Gözlemci var ise*; Bu oturumda gözlemci olarak çalışma arkadaşım bizimle olacak. Görüşme boyunca sadece sizi izleyip notlar alacak. Olur da sorusu olursa bana görüşme sonunda iletecek, ben de onları size oturumun sonunda soracağım.]

İzninizle şimdi size süreçle ilgili bilgilendirme yapacağım. Bu oturum yaklaşık olarak 30 dk. sürecek. Araştırma kapsamında genç basketbolcular için geliştirilecek mobil uygulamanın sizin gibi gerçek kullanıcılar için istendik şekilde çalışıp çalışmadığını öğrenmek istiyoruz.

Özellikle vurgulamak istiyorum. Bu bir sınav değildir. Doğru ya da yanlış cevap yoktur. Burada odak nokta, geliştirilen uygulamanın arzu edildiği gibi çalışıp çalışmadığını test etmektir. Bu nedenle, doğal ve rahat olun çünkü sizin doğal ve rahat olan kararlarınız ve hareketleriniz gerçek bir kullanıcıyı yansıtacaktır. Merak etmeyin, ürünle ilgili yorumlarınız veya tepkileriniz bizim veya ürünü tasarlayanların duygularını incitmeyecektir.

Eğer onam formu önceden gönderilip imza alınmadıysa: Bu onam formu bu görüşmenin amacını ve içeriğini, görüşmede bize vereceğiniz bilgilerle ne yapacağımızı ve ne yapmayacağımızı açıklıyor. Formu baştan sona okuyup isim, soy isim ve tarih atıp, imzalamanızı rica ediyorum.

Bugün telefonunuzda bazı senaryolar üzerinden giderek sizden bazı görevleri ve işlemleri yapmanızı isteyeceğim. Bu uygulama halen geliştiriliyor. Bu nedenle her zaman düzgün çalışmayabilir veya istediğinizi yapmayabilir. Eğer beklenmedik bir şey olursa endişelenmeyin. Uygulamayı bozmadınız. Bu tür teknik aksaklık anında ne yapmanız gerektiğini ben size söyleyeceğim.

Herhangi bir noktada ara vermek isterseniz, çekinmeden söyleyin. Yanıt vermek istemediğiniz bir soru olursa ya da yapmak istemediğiniz bir görev olursa lütfen söyleyin. Başlamadan önce herhangi bir sorunuz var mı?

Görüşmenin kayıt altına alınmasını onaylıyor musunuz peki?

Isınma Soruları

Görevlere başlamadan önce kendinizden biraz bahseder misiniz? Kaç yıldır basketbol oynuyorsunuz? Basketbol Gençler Ligi'nde hangi kulüpte, hangi mevkide oynadınız? Ne kadar süre bu kulüpte oynadınız?

Basketbola yönelik kullandığınız mobil uygulamalardan bahseder misiniz? [Sonda: Ne sıklıkla kullanıyorsunuz?]

[Eğer performans takibi için bir uygulamadan bahsetmez ise] Basketbol performansınızı takip etmek için bir mobil teknolojiye yararlanıyor musunuz? Hangi mobil uygulamayı/uygulamaları kullanıyorsunuz? Ne sıklıkla kullanıyorsunuz?

Kullandığınız bu mobil uygulamalarla ilgili tecrübelerinizi genel olarak anlatır mısınız?

Cevaplarınız için çok teşekkür ederim. **Başlamadan önce sizden yapmanızı istediğim çok önemli bir şey daha var. O da bu uygulamayı kullanırken sesli düşünmeniz.** Demek istediğim, uygulamayı kullanırken ve verilen görevleri yaparken sizden ne yaptığınızı, yaparken aklınızdan ne geçtiğini, ne düşündüğünüzü, ne hissettiğinizi sesli olarak sürekli konuşarak anlatmanız. Örneğin, bir tıklamada ya da bir görevi yaparken beklediğinizden farklı bir sonuçla karşılaşırsanız veya bir sonraki aşamada ne yapacağınızı çözmeye çalışıyorsanız lütfen bunları bize sesli olarak söyleyin.

Yapacağınız görevleri veya işlemleri size ben vereceğim. Bu görevleri veya işlemleri yaparken sanki tek başınıza yapıyormuş gibi yapmanızı ve normalde ne kadar uğraşırsanız o kadar uğraşmanızı istiyorum. Siz bunu yaparken, ben burada olacağım ancak uğraştığınız görev veya işleme dair sorularınızı cevaplamayabilirim. Bir görevi veya işlemi tamamladığınızı düşündüğünüzde **“Bitirdim”** veya **“Ben burada bıraktım/dururdum.”** diyebilirsiniz.

1- Peki, hadi başlayalım. Sizden yapmanızı istediğim ilk şey vereceğim görevi seslice okumanız ve daha sonra o görevde sizden istenilen şeyi yapmanız.

- **Görev a:** Size gönderilen dosyayı telefonunuza indirin ve kurulumunu yapın. Ardından giriş ekranına sizinle paylaşılan kullanıcı adı ve şifresini girin ve “Devam Et”e tıklayın. Bu işlemleri yaparken lütfen sesli düşünün.
- **Görev b:** Size gönderilen linke tıklayın ve ardından uygulamaya kişisel bilgilerinizle kayıt olun. Sonra kullanıcı adı ve şifrenizi girin ve “Devam Et”e tıklayın. Bu işlemleri yaparken lütfen sesli düşünün.
- [Katılımcı giriş ekranında gezinip, düşüncelerini söyledikten sonra detay vermemişse] Giriş/Kayıt ekranında gözünüze çarpan bir şey var mı? Biraz açıkla mısınız?
- [Kullanıcı giriş/kayıt ekranıyla ilgili ilk izlenimlerini anlattıktan sonra] Giriş ekranına 1 zayıf ve 5 mükemmel olmak üzere 1 ile 5 üzerinden kaç puan verirsiniz? [Kullanıcı puan verdikten sonra] Neden bu puanı verdiğinizi açıkla mısınız? [Amaç aklındaki tam olarak anlamaktır].

- [Katılımcının ipucu istediği durumlarda] “Yalnız başına bunu yapıyor olsaydınız, nasıl yapardınız?”

2- Sizden yapmanızı istediğim ikinci şey vereceğim görevi seslice okumanız ve daha sonra o görevde sizden istenilen görevi yapmanız.

- **Görev:** İlk olarak ana sayfada gezinin. Ardından uygulama içinde diğer sayfalarda gezinin. Bu işlemleri yaparken lütfen sesli düşünün.
- Sizce bu uygulama ne için tasarlanmış?/Sizce bu uygulamada ne yapabilirsiniz?
- [Katılımcı uygulamaya ve tasarımına dair düşünceleri ile ilgili detay vermemişse] Uygulama ile ilgili görüşleriniz neler? Uygulamanın tasarımını nasıl buldunuz?
- [Katılımcı giriş ekranında gezinip, düşüncelerini söyledikten sonra detay vermemişse]
Ana sayfada ve diğer sayfalarda gözünüze çarpan bir şey var mı? [Biraz açıkla mısınız?]
- [Kullanıcı sayfalarla ilgili ilk izlenimlerini anlattıktan sonra] Bu sayfalara 1 zayıf ve 5 mükemmel olmak üzere 1 ile 5 üzerinden kaç puan verirsiniz? [Kullanıcı puan verdikten sonra] Neden bu puanı verdiğinizi açıkla mısınız? [Amaç aklındakini tam olarak anlamaktır].
- [Katılımcının ipucu istediği durumlarda] “Yalnız başına bunu yapıyor olsaydınız, nasıl yapardınız?”

3- Teşekkürler. Şimdi bir sonrakine geçelim. Üçüncü görevi sesli olarak okuyun ve daha sonra istenen görevi yapmaya çalışın.

- **Görev:** İstatistiklerinizi diğer oyuncuların istatistikleri ile karşılaştırın. Bu işlemleri yaparken lütfen sesli düşünün.
- [Katılımcı istatistiklerde gezindikten sonra istatistiklere dair detay vermemişse]
Bu görevde gözünüze çarpan bir şey var mı? İstatistiklerle ilgili ne düşünüyorsunuz? Anlaşılabilir mi? Kısaltmaların ne olduğunu anladın mı? Anlamadıkların için nasıl bir yol izlersin? [Biraz açıkla mısınız?]
Bu göreve 1 zayıf ve 5 mükemmel olmak üzere 1 ile 5 üzerinden kaç puan verirsiniz? [Kullanıcı puan verdikten sonra] Neden [verilen puan] verdiğinizi açıkla mısınız? [Amaç aklındakini tam olarak anlamaktır].
- [Katılımcının ipucu istediği durumlarda] “Yalnız başına bunu yapıyor olsaydınız, nasıl yapardınız?”

4- Teşekkürler. Şimdi bir sonrakine geçelim. Dördüncü görevi sesli olarak okuyun ve daha sonra istenen görevi yapmaya çalışın. Lütfen görevi yaparken sesli düşünerek neyi niye yaptığınızı anlatmaya devam edin.

- **Görev:** İstatistiklerinizle performansınıza yönelik iki farklı hedef belirleyin.
- [Katılımcı hedef ekranında gezinip, düşüncelerini söyledikten sonra detay vermemişse]
Bu görevde gözünüze çarpan bir şey var mı? Biraz açıkla mısınız?

- [Kullanıcı görevle ilgili ilk izlenimlerini anlattıktan sonra] Bu özelliğe 1 zayıf ve 5 mükemmel olmak üzere 1 ile 5 üzerinden kaç puan verirsiniz? [Kullanıcı puan verdikten sonra] Neden bu puanı verdiğinizizi açıkla mısınız? [Amaç aklındaki ni tam olarak anlamaktır].
- [Katılımcının ipucu istediği durumlarda] “Yalnız başına bunu yapıyor olsaydınız, nasıl yapardınız?”

Tüm görevler tamamlandıktan sonra uygulamanın tümüne dair yorum yapmamışsa] Uygulamanın tamamına dair genel düşüncelerinizi söyler misiniz? Uygulamanın tamamını bir bütün olarak 1 çok zayıf ve 5 mükemmel olmak üzere 1 ile 5 arasında bir puan verir misiniz? [Kullanıcı puan verdikten sonra] Neden [verilen puan] verdiğinizizi açıkla mısınız? [Amaç aklındaki ni tam olarak anlamaktır].

- Uygulamayı takım arkadaşlarınıza ya da diğer basketbolculara önerir misiniz?
- Gerçek yaşamında basketbol performansını takip ettiğin en son zamandan biraz bahseder misiniz? Bugün izlediğin yol ile her zaman izlediğin yolu nasıl karşılaştırırsınız?
- Genel olarak uygulamanın geliştirilmesi gerektiğini düşündüğün bir nokta var mı?
- Böyle bir uygulamanın senin performansına yönelik etkileri ne olur sence?

Çok teşekkürler. Geri bildirimleriniz bizim için çok kıymetli. Yaptıklarınızla ilgili herhangi bir sorunuz, eklemek istediğiniz bir şey var mı? [Varsa soruları yanıtlayın.] İzninizle bizi izleyen gözlemcimizin sorularını öğrenmek ve varsa soruları size sormak istiyorum.

Evet, görüşmemizin sonuna geldik. Zamanınız ve katkınız için çok teşekkür ederim.

İpuçları:

[Oturum sonrası varsa görüşme bölümünde katılımcıya senin ya da gözlemcinin sormak istediğin soruları sor. Özellikle kullanıcının bir görev veya işlemi yaparken söylediği veya yaptığı bir şeyle ilgili daha fazla şey öğrenmek isterseniz ister görevi veya işlemi tekrarlatarak isterse sadece anlattırarak tekrar açıkla tın. Bu süreçte önceki süreçlerde olduğu gibi yönlendirme yapmayın.]

[Sonda soru örnekleri:

- Biraz açıkla mısınız?
- Bundan biraz daha bahsedin lütfen.
- Bu dediğiniz diğer durumlarda da oluyor mu?
- Sanırım söylediğiniz şey şu.....
- O zaman şunu mu diyorsunuz.....”

APPENDIX-6. Qualitative Usability Test Tasks

“Görevler

- 1a. Size gönderilen dosyayı telefonunuza indirin ve kurulumunu yapın. Ardından giriş ekranına sizinle paylaşılan kullanıcı adı ve şifresini girin ve “Devam Et”e tıklayın. Bu işlemleri yaparken lütfen sesli düşünün.
- 1b. Size gönderilen linke tıklayın ve ardından uygulamaya kişisel bilgilerinizle kayıt olun. Sonra kullanıcı adı ve şifrenizi girin ve “Devam Et”e tıklayın. Bu işlemleri yaparken lütfen sesli düşünün.
2. Ana sayfada kalın. Ardından uygulama içinde gezinin. Bu işlemleri yaparken lütfen sesli düşünün.
3. İstatistiklerinizi diğer oyuncuların istatistikleri ile karşılaştırın. Bu işlemi yaparken lütfen sesli düşünün.
4. Performansınız için iki farklı hedef belirleyin. Bu işlemi yaparken lütfen sesli düşünün.”

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Education

Doctorate of Philosophy 2017-2023	Anadolu University Graduate School of Health Sciences Physical Education and Sports Programme
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Occupational Experience

Research Assistant 2018–Ongoing	Eskişehir Technical University Faculty of Sports Sciences Department of Physical Education and Sports Teaching
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Articles Published in SCI, SSCI and AHCI Indexed Journals

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19. Yanardağ, M., Yılmaz, İ., Kurnaz, E., Özböke, C., & **Taşçioğlu, R.**, (2016). *The effects of the adapted physical education and sports on motor performance and physical fitness of the young and children with autism spectrum disorders* [Oral Presentation]. 3rd International Sport Sciences, Tourism and Recreation Student Congress. Gaziantep, Türkiye.

Projects

	Name	Year	Type	Position
1.	Omuz Yaralanması Geçirmiş Hentbolcuların Kaygılarının İncelenmesi: Durum Tespiti	2021-2022	Higher Education Institutions Supported Project	Researcher
2.	Basketbol Oyuncularının İstatistiklerini Kategori Bazlı Sunan Bir Mobil Uygulamanın Hedef Belirleme Kuramı Çerçevesinde Geliştirilmesi: Tasarım Tabanlı Araştırma	2020-2023	Higher Education Institutions Supported Project	Researcher
3.	Basketbol Gençler Ligi (BGL) ve TBF Uluslararası Yıldız Erkekler Basketbol Turnuvası'nın Boylamsal Olarak İncelenmesi	2020-2021	Higher Education Institutions Supported Project	Researcher
4.	Beden Eğitimi Öğretmenleri için Hizmet İçi Eğitim Ölçeğinin Geliştirilmesi	2020-2021	Higher Education Institutions Supported Project	Researcher
5.	Otizm Spektrum Bozukluğundan Etkilenmiş Çocuklarda Aerobik Fiziksel Uygunluk Seviyesi ile Yürüyüş Örüntülerinin Değerlendirilmesi	2016-2018	Higher Education Institutions Supported Project	Researcher
6.	Beden Eğitimi ve Spor Öğretmenlerinin Mesleğe Yönelik Davranış ve Yaşantı Modellerinin Belirlenmesi ve Bazı Değişkenler Açısından İncelenmesi (Eskişehir İli Örneği)	2016-2017	Higher Education Institutions Supported Project	Researcher
7.	Aday Öğretmenlerin Mesleğe Yönelik Davranış ve Yaşantı Modelleri ile Zihinsel Sağlıklarının İlişkisi	2016-2017	Higher Education Institutions Supported Project	Researcher

Awards

1. Eskişehir Technical University, **Article Performance Award**, 2020

Memberships

1. Sports Sciences Association
2. European College of Sport Science
3. Turkish Basketball Coaches Association