Research Article

Design Thinking application for a digital product prototype for soccer branch

Paulo Francisco Gomes Ferreira[1]*, Lucas Slongo Zandoná[1], Patricia Flores Magnago[2], Álvaro Gehlen de Leão[2]

[1]Pontifícia Universidade Católica do Rio Grande do Sul – PUCRS, Porto Alegre, RS, Brasil
[2]Pontifícia Universidade Católica do Rio Grande do Sul – PUCRS, Escola Politécnica, Porto Alegre, RS, Brasil

Abstract

The athletes reception and selection represent the biggest opportunity for young soccer players to get into a club. However, it is perceived that this process still with a high content of subjectivity. This study aims to develop, from Design Thinking, a way of athletes' selection alternative to the actual process, using data analysis of their main physical and technical characteristics. This methodology is generally used for innovative solutions, improvement plans for existent products, and to enable new market entrants. Design Thinking focuses on final user satisfaction, with empathy to their pains and trying to solve them. The results allowed us to identify the main problems faced by the personas, such as the subjectivity involved in the process, the athletes' needs to be seen, and the lack of robust resources that allow the data analyzed by soccer market analysts. For validation of the selection method, was developed an app that encompassed solutions for clients' requirements, as reports Generation with athletes' principal characteristics, filters systematically that segment athletes' according to clubs needs and grouping by attributes. As result, we achieved a virtual app that represents soccer analysts' athletes' data reports, with their main qualities, as their physical and technical characteristics, such as videos. The prototype was shown to users, which that evaluated with a satisfaction survey and proposed improvements for the second round of analysis.

Keywords: design thinking, prototype, app, soccer, Athlete's capitation.

1. Introduction

Soccer is the most famous sport in the world and its number of supporters keeps growing in the whole world (Nielsen Company, 2018). It is a sport that involves millions of passionate people for their clubs and histories and some of their players are treated as holy entities for their achievements. Your market moves 53 billion in the Brazilian economy, which represents 0.72% of the country's Gross Domestic Product (GDP) (Ernst & Young, 2019). Brazilian soccer counts 360,291 athletes, considering amateurs, professionals, and registered players. Of this whole, 88 thousand are professionals, that is, 24.4%. Within this value, only 11,600 athletes had active contracts all season long for their clubs, representing 3.2% of the total (Ernst & Young, 2019). The called soccer schools associated with big clubs realize what we call "peneiras" for young athletes' capitation, and They are the main gateway to access to these clubs (Lopes, 2018). The idea of creating an application for young players' capitations to supply small, mid, and big clubs emerged by identification of a failure in this market niche.

To Rosa (2009), young from the outskirts dream with fame and money brought from soccer, but They do not know the difficulty that exists at the beginning of this career, which minority reaches professional level. In case the athlete doesn't be selected, he ends up having to stop playing unwittingly. Lots of young when they stop playing, end up underemployed on the fringes of society. According to Erthal & Lemos (2010), soccer schools are for those who want to pay and play, but scouts and entrepreneurs utilize waves that present themselves voluntarily to pan and make money with teenagers with a disposition to face life full of training routines and space dispute. According to the same authors, if a young's dream is to be a soccer player, soccer entrepreneurs' goal is to discover someone to educate, value the past, and profit from.

It is a mutual agreement between everyone who likes this sport is that there are opportunities that must be raised and treated, technologically and innovatively, looking for clubs and federations process improvement. In the middle of them, is the preferred process of potential new players identification. Online platforms targeted at the soccer environment have grown last few Years. Physical preparation was the most benefited by Science and Technology (Moura, 1997). Softwares have helped development analysts, making information being quickly removed from the analysis and thus being passed on to the technical committee and players (Estanislau, 2016).

For example, Instant Scout, which supplies technical and physical information in a database with more than 400,000 in the world, for the club's analysts may accomplish their assessments; and Footstats Premium, which brings, in real-time, match's statistics from the main disputed championships by Brazilian teams (Doering, 2018).

However, there are just a few solutions of platforms that aim to optimize clubs' management with their athletes (Silva et al., 2016) – like in captation, selection, and talent management cases. Comes up with demand for new solutions around the soccer segment, to make easier the information management to who act in this market (Russo, 2008). According to Silbermann (2010), soccer players transformed into data describes these borders ruled in interaction and incorporation progressive with technology. From this global information between agents, many activities with highly processing lead time can still be reduced by innovation, which can act as a promoter in clubs and federations transform.

It is normal to relate innovation with technological advances or something new, in a hard tone of understanding. Innovation can also be something incremental. When a product is breaking new grounds, causes an impact on people's lives and transforms their way of working Forever (Brown; Katz, 2010). But, if innovation is not Only launching new possibilities of products or services, what else could it be? Innovate also improves what's already exists and understands the human being deep, co-create the solutions with him and try them out Early, before it's too late to adjust them.

One methodology that has been shown efficient in the Direction of innovative processes and methods it's Design Thinking, which, according to Vianna et al. (2012), it's linked with the way of seeing and solving problems, through a different and unusual logic in the corporative environment, the abductive way of thinking, which is a co participative that generates opportunities to innovation. For Brown & Katz (2010), Design Thinking begins with skills that designers have learned over lots of decades in Search of establishing the correspondence between human needs with the available technical resources considering the practical business restrictions. The goal is to transform observations into insights, and this in products and services to improve people's lives using co-creation with users and exploiting scenarios in joints, improving comprehension and the empathic link for them, which is the target audience of the solution (Brown & Katz, 2010).

Design Thinking has been shown as an important tool for digital products prototyping. According to Bertolo et al. (2015), in his prototyping of an urban transport app, noticed that Design Thinking may be efficient in software development, considering that its initial phases and techniques don't go too far of common processes, making possible the mix of faces and processes, like Immersion, define, idea, prototype, and test. This face help with the validation of established requirements, that is, on product Projects. As Vetterli et al. (2013) said, Design Thinking is consistent with initial practices of product Projects and customer relationships.

In this context, this article has as target to answer the following research question. Is It possible to structure an innovative solution for young players to be seen by clubs through Design Thinking methodology? To answer that, this work has as a general goal to propose a caption and selection systematic of new soccer talents, developing a digital solution for the process based on Design Thinking. The specified goals are: (i) prototype a solution based on previous analysis; (ii) test and authenticate the prototype with stakeholders. The solution is a Joinfut managers Project, a company situated in Porto Alegre, that will work together with young players, market analysts, coaches, and clubs in the athlete's adaptation process.

The article is limited to achieving a prototype based on virtual screens, and not a functional app, due to financial restrictions. From the prototype, the stakeholders can see the mold of the app and argue if this complies with his needs. The involved costs with each component development were not considered for this study, leaving to be verified in another analysis.

This work is structured in four sections: the first presents the scenario in which the study is inserted. Following, in the second section, the research method and the implemented work in the study and based on theoretical references. The third section is shown the practical application and the analysis of the achieved results. In the last section, final considerations about this article.

2. Method

The method aims to orient the data collected, approaches, and techniques used by the author in this article development.

2.1 Researching method

The present work is defined and marked as a case study. According to Rodrigo (2008), the case study is identified as a kind of research in which the investigator does not pretend, necessarily, act on the built-up situation. This research characterizes this procedure because the purpose is to interpret the data presented the

way the situation is realized, being your analysis an important base for sequential acts for the work. Thereby, this work has the opportunity of giving an analytic aspect in this case.

This work is accomplished in a cross-sectional, in a carryout Applied work and exploratory goal. The cross-sectional feature is identified because it is a study that factors, and effects are observed at the same moment. This Applied study objectives to create acknowledgments for practice applies directed to specific problem solutions Where involves truths and local interests (Silva & Menezes, 2001). Your goal characterizes as exploratory because looks for provides greater familiarity with the problem, objecting to making it explicit (Silva & Menezes, 2001). How do interviews with people who had the practical experience are involved, this exploratory aspect is evidenced?

It has a quality-quantitative approach on behalf of individual point of view worries. The qualitative approach considers subject proximity, in the second, this proximity is measured by empirical methods. Will be collected research data to analyze for the main client's needs, from questions with open answers (qualitative). As well as quantitative nature, will be objective questions (quantitative) about the gathered demands by the interviewed public, and the descriptive analyses were established.

2.2. Methodological Pathways

Design Thinking is used as the base of the app development, which is forged in the following steps: plunging and empathy, define, idea, prototype, and test by an adapted model test from Hasso-Plattner Institute of Design at Stanford (2018) – Figure 1. It's a user-centered system and, from the beginning to the end, looks for having this contact with their clients. For Hasso Plattner (2018), Design Thinking it's a journey that engages many-sided teams with different background components, with science, engineering, and design, guiding efforts to users' desires.

The original methodology denotes the related goals and concepts to each step, enabling the designer to realize which are the most appropriate tools for the application, that's why the author fits. Each step is detailed in the subsections below.
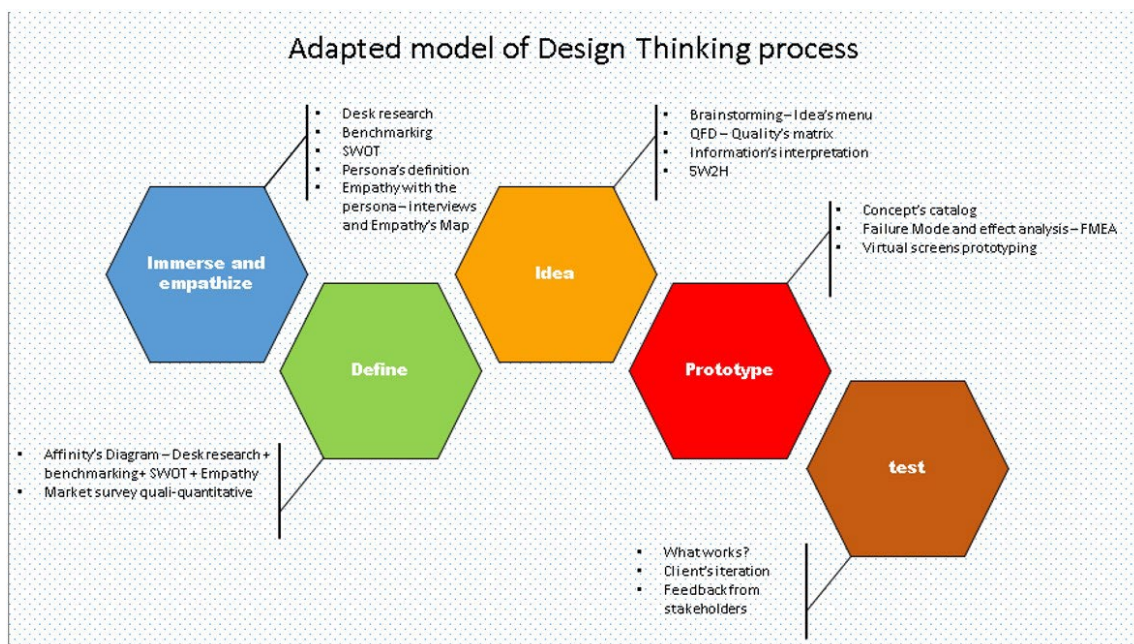

Figure 1. *Design Thinking process.* Source: adapted by the author from *Hasso-Plattner Institute of Design at Stanford (2018).*

2.2.1. Immersion

The first step is immersion. In this case, developers look for the problem, involving discussions about this coefficient between them. According to Vianna et al. (2012), this step must be observed the insights from the raised questions and inputs from research and context.

For Hasso-Plattner Institute of Design at Stanford (2018), the designer must go hard into the problem to feel users' pain. Must be created ways to specified ambients immersions which users are inserted. The bests solutions come from the best's insights from human behavior, discovering emotional devices. With this, is possible to Picture innovative solutions (Hasso-Plattner Institute of Design at Stanford, 2018). The author, over this Design

School perspective, uses for this step the Desk Research, benchmarking, swot matrix, persona, interviews, and empathy map tools, looking for problem understanding and planning next steps.

According to Alves et al. (2014), the immersive step can be divided into preparatory and profound. At first, is looked for the problem understanding through exploratory field research and desk research, for the references survey of information in sites, books, etc. In it are defined the main stakeholders for this project, besides the scope, limits, and executions restrictions (Alves et al., 2014). After, searches through interview-based research, structured or not, exploitation with the major stakeholders about the problems way of view contexts (Alves et al., 2014).

After defining the problem, the Project initiates with raising information about it, by realizing desk research of minor data which, according to Fernandez (2019, allows the designer to learn with the results of different research available for the great public. In it, are constructed the main relevant data for the problem analysis.

With this desk data is structured and organized, is performed benchmarking with companies that operate with clubs offering data analysis tools. Benchmarking, according to Ferreira & Ghiraldello (2014), is a strategic tool that must be considered in the application of a continuous process of best practices of identification.

After desk research and benchmarking, are verified by the surveyor the strengths, weaknesses, opportunities, and threats (SWOT), structuring it on a matrix. For Silva et al. (2011), SWOT has the intense to comprehend influencing factors and present how They can affect the business objective based on already mentioned variables.

This initial research serves as a base for the persona modeling process, which is guided by empathy in its definition, modeling, and application. Empathy is the central aspect of the user approach. According to Brown & Katz (2010), empathy is the mental habit that takes us to think about people as people, not as guinea pigs?? or standard deviation. Empathy is characterized as being the development link with people that are being observed fundamentally. If having empathy with other's lives to inspire new ideas, it must start by recognizing that your conduct inexplicable represents different strategies to deal with this messy, complex, and conflicting world Where we live (Brown & Katz, 2010).

The persona generates the empathy map, which contributes to the identification process of stakeholders' needs. The Empathy's Map searches for comprehending persona's perceptions and limits, to build and/or develop new products and services. The stands out as the main strength of the tool's usefulness, because of its visual presentation form, favoring discussions and brainstorming about new product's creation from this client perspective (Serviço Brasileiro de Apoio às Micro e Pequenas Empresas, 2016). For Bedin et al. (2017), with this map is possible to build a "character" who represents the client.

2.2.2. Definition

This step aims at finding the problem's clarity, Where the design planning for problem-solving, based on the collected data and face-to-face observations with the client, are viewed. Occurs after the empathy's process with the persona, in another word, when de designer defines the challenge that he is taking on. It encompasses the management and syntheses of the collected data from immersion and empathy with the persona, and the action's planning that will be realized after this.

For Hasso-Plattner Institute of Design at Stanford (2018), the definition step transforms all aspects searched in the immersion in needs and perceptions, in the hunt for a bigger challenge. Based on the designer's comprehension of the persona's problem, is developed his point of view about the problem. This reformulated point of view can then be used as a solutions generator trampoline (Plattner, 2018). According to the Standard Design School targeting the problem, the author decides to use tools like Affinity diagram and quali-quantitative research, to verify possibilities of Solutions found and the perceptions around that.

The Affinity Diagram is a graphic display of original and creative categories or idea dimensions, according to Bezerra (2007). Used when there is a large amount of data from the research to identify connections between topics and opportunities areas for the project (Vianna et al., 2012). The diagram aims to group the previously collected data, withdrawn from Desk research, benchmarking, SWOT, and Empathy's Map, beyond the gathered information from interviews with the personas. The data from each tool that, previously apart, is get together in an only record, for helping the decision-maker to plan the future steps. The data simply are made up according to mutual affinity.

There was elaborated market research with quantitative questions, in a survey way, for the involved stakeholders to answer. The consolidated data results in analytic charts for better comprehension and result's view, directing their use to the next process step of ideation.

2.2.3. Ideation

According to Silva et al. (2016), the ideation step has as objective to generate ideas of Solutions for the problem in question. In this step the problem's context is understood by the researchers and, over gathered information from the market research, are generated insights focused on the solution.

For Hasso Plattner (2018), ideation generates radical alternatives of design. Ideation, for the same, is an enlargement process in terms of concepts and results – a way to generate and "burn" ideas, instead of focus. Your goal is to explore a wide space of solutions that, from the vast generated ideas repositor, can be built prototypes to test with users. The idea Generation is a moment to expand the sight during evaluation, and the idea selection is the moment to strengthen. Innovative concepts may come, mostly, from weird ideas (Plattner, 2018). For this step of development, the designer utilizes tools such as a menu of ideas, QFD, and 5W2H.

In this step is included the market research-oriented to the QFD – Quality Function Deployment. The QFS is used as a driver to the decision making, allowing identification, collection, analysis, and dissemination of information in an objective and systematic way, and the information's use to improve decision making related to identification and problem's Solutions and marketing opportunities, causing it to have systematic (systemic?) from relations between Customer requirements and product characteristics (Peixoto & Carpinetti, 1999).

According to Cunha (2000), QFD guides the analysis of a group of matrices and has a starting point for market research with the target Customer from the company. As delimitation of this study, as developed only the quality matrix, looking for verifying of focus on client's perception in front of the tools and product's variables.

According to Akao (1996), a new product quality utilizes characteristics of a technical nature quality. Before that, is highly necessary and advised to seek to understand the client's requirements (This feature is directly found in the Design Thinking proposal). Therefore, it is interesting to previously identify the involved people's needs, because allows to analyze and prevent potential failures and quality issues, which can negatively impact customer experience with the product.

According to Cota Júnior & Cheng (2006), QFD is also used in the software development process, to increase product quality. IT Is done, so, an adaptation from the original method to the app prototyping environment.

Herzwurm & Schockert (2003) show a difference between the QFD process and others software. For them, the app is not identified by its physical characteristics, but for the consumer conduct while using it. It is concluded that, for such, QFD has a greater focus in the initial phases of development.

The Quality Matrix translates the client voice in information from the product development Project, allowing the graphic and charts Generation. Cheng & Melo Filho (2007), indicates the following steps: (a) identify customer needs; (b) converting needs into required qualities; (c) outspread required qualities by chart construction; (d) chart construction for planned quality; (e) outspread quality characteristics by chart construction; (f) correlation between demanded qualities chart and quality characteristics chart; (g) conversion for a designed quality chart; (h) formulation of the quality matrix.

With the QFD data, generates a support catalog for the ideation process for the development team by brainstorming sessions involving the project's designer. This session was discussed the main aspects of the product valued by Joinfut and the obtained results from QFD. Around that, the company managers discussed how They should provide the higher graded components of the product. Were planned elements involving marketing, costs, and layouts? With this, was created a menu of the ideas, to facilitate and stimulate the appearance of the main concepts that the product will have. For organizational purposes, from this catalog, it is possible to analyze and verify the principal product features that the client and company enrich for better use.

With the checks done, and 5W2H matrix is structured, focused on action planning from previously raised data, for a better data organization already gathered and planned the product components distribution. The 5W2H is a tool that registers an organized way HOW actions will be executed, by WHO, WHEN, WHERE, WHY, HOW MUCH, and WHAT. According to Reis et al. (2016), the 5W2H uses a skilled and efficient way to formalize this idea for prototyping activities carrying out. With this, the main aspects shown in the QFD are analyzed and placed in 5W2H, for the action planning purposes aligned with the client perceptions.

2.2.4. Prototyping

With the completion of the ideation stage, the study is directed to the penultimate phase from design thinking, named prototyping, where modeling application and products concepts happen, analyzed in the previous phases. Prototyping – the disposition of moving forward and testing any hypothesis Building the object –is the best evidence of experimentation (Brown & Katz, 2010). According to Brown & Katz (2010), David Kelley, IDEO and Stanford Designer School founder, calls the "thinking with the hands" prototyping and compares with the abstract thinking guided by specifications and planning.

For Hasso Plattner (2018), prototypes have more success when people (design team, users, and others) can try and interact with them. They are an amazing way to start a conversation. Prototyping is, many times, considered a way to test product functionalities, but it serves many other purposes. Among these purposes, we can consider deepening the understanding of users and design, the development of many concepts for the test, prototypes creations for the test, and solutions refining (Plattner, 2018).

For prototyping, the author developed a solution in a not functional virtual prototype solution. It Was used the design platform called Marvel App to model formats and not functional app components. When it comes to an app that will be used in notebooks and cellphones, for documented registration purposes, it is represented in screens, Where the images represent and reflect the previously gathered analysis results. The prototypes images are presented in PowerPoint.

A risk analysis is performed from the prototype to mitigate potential failures that the product comes to have through the FMEA. The FMEA – Failure Mode and Effect Analysis – tool is useful in the present work because allows it to analyze and detect potential failures that the product will have, identifying solutions to mitigate them. According to Almeida (2006), FMEA varies between assessing the functions, used materials, components, tolerances, etc. Palady (1997) shows the benefits to do an FMEA, effective in product development. It points to the increase of customer satisfaction, which serves as a driver to plan more efficient tests.

Procedures and support charts for FMEA are in the Appendix A of this study.

2.2.5. Test

The last Design Thinking stage is testing. It was the moment of the created prototype presentation to the customer looking for feedback. In this step, is made a satisfaction survey with a sample of our market research interviewed. According to Rossi & Slongo (1998), the information about customer satisfaction levels composes one of the highest priorities in the company's management compromised with products and service's quality and, consequently, with achieved results with their clients.

For Plattner (2018), the testing stage allows the designer to create authentic experiences for prototype users. Also serves to know more about the user, allowing to build empathy using observation and commitment – many times unexpected. This step informs the next prototype's iterations. Sometimes, this means going back to the clipboard (Plattner, 2018).

3. Results

The particle study application was realized according to the proposed sites in the work method and the results will be subdivided in the same way in this session.

3.1. Immersion

In the immersion step, the designer had as an objective come near to the project's context and identify the problem to be solved. To start this comprehension, the first used tool was the desk research, which was formed to understand the involved problems to be solved by the researcher. In addition, sought to gather, from the choice, the main causes to their occurrence.

The Desk research started raising information about the capitation and athletes' selection context inside the soccer market, Where the author verified 3 potential problems to be solved, according to the register in Appendix B. The caption and athletes' selection process nowadays, as raised, manifests as an empirical and minimal data-based process, which makes it slightly robust. This was the chosen problem to be solved by the author.

As the main causes of the problem stand out the lack of standard criteria to capitation and selection, and the high involved subjectivity, the little scientific base, and access difficulties that lower Middle class young's have about soccer trials. Furthermore, it was found that the clubs allocate low investments in this operation, making that the respondents don't have better resources to execute their job. The athlete's capitation and selection, although is one of the main gateways to young, don't have the proper investment and, from this moment, is inevitable to highlight the club's necessity of understanding the importance of financial input to improve conditions of the whole process (Universidade do Futebol, 2017).

With the next immersion step, were realized benchmarking interviews with companies from the same line of business as Joinfut. The companies WitSoccer, "Rede do Futebol", and DSFootball share relevant requirements for market development and setting of the product, under the optic of two points of view: Business strategy and product development. This study focused on deepening product requirements, leaving the business-relevant points to another evaluation.

The first step for interviews Building content was defining the potential basic tools of the product. The second and last one was to accomplish the survey of the standard characteristics offered by the companies, from product analysis, interviewed companies' app download, author experience in the Sporty environment, and interviews software using.

Benchmarking for athlete's caption app brought together, as mentioned, 3 big companies. So, were used the most important product functionalities as a basis to compare the performance between the companies. The selected functionalities were the Use of Big Data to feed the data; athletes report Generation with their main

particularities; selection filter with physical and technical players characteristics; robust security information system; modeling.

Beyond that, was used Google App Store, which is an ambient Where many apps are rated, considering information returned to the user's experience fronting this platform. The Google tool utilization was important for customer experience analysis because it develops an algorithm that considers qualitative opinions, over feedbacks, as also a 1 to 5 rating, in other words, quantitative, for numerical parameterization. For the "Rede do Futebol", was not found any rating. As tool support, follow the chart in Appendix C.

The Witsoccer platform showed up as an exponent in the player capitation market through data usage. The idea of their product consists of, using records made by athletes, evaluating with standard tests their technical, physical, and tactic qualities and, according to the performance, forwarded to the clubs. The company realizes 3 tests before the result: the first is a technical one, remote, that develops within a series of steps; the second test is of a series of physical tests; and the last is a final trial in the company, to evaluate the players inside playing field. The well-rated athletes in the three assessments are forwarded to the club.

The "Rede do Futebol" business model is player mapping and recommendation, from 12 years of age. The players are mapped according to their link in the IDB (Daily Newsletter) of CBF. The virtual platform report to clubs the performance numbers of linked athletes so that They can hire.

DSfootball focuses on athletes forwarding to clubs beyond internal company evaluation. With this registration in the app, the company makes available an online test encompassing the technical and physical characteristic rating, so that They can be rated for the company's internal analysts. With this initial filter, the DSFootball analysts direct to the clubs the approved athletes, which consequently have a high probability of approvals in trials.

The raised material in desk research and interviews left for the SWOT matrix, which allowed the designer to view the strengths, weaknesses, opportunities, and threats of the business, according to Figure 2. The SWOT showed up important also because allowed to identify the model product's strategy with the market scenario. Stood out some parameters located in the opportunities and strengths scales of the product. As strength can be highlighted the use of selection filter with specified information required by customers and, an opportunity, the possibility of connecting the product with another's platforms database.

Strenghts	Weakness
Product: 1) Low model's product complexity; 2) Big Data; 3) Product with easy access to new incoming athletes; 4) Use of selection filters with specified information required by clients; 5) Generation of management reports that supply updated information to clients;	**Product:** 1) Low possibility to connect the product with other platform or database; 2) Unfeasibility of product's modularization;
Product: 1) Possibility to connect the product with other platform and database; 2) Mapping and classification of the highlighted players from the main common interest championships for clubs;	**Business:** 1) Consolidated companies in the market and conscious of the constant transformations; 2) Clubs, in general, do not have a structured and standardized captation process; 3) Clubs resistance of using a third one data platform; 4) Legislation's changes;
Opportunity	Threats

Figure 2. SWOT Analysis. Source: Elaborated by the author.

With the structured SWOT matrix, the definition of the involved personas was developed. The author used Appendix D as support to it. The personas were identified according to the initial realized study. The author defined those two main stakeholders could be attended with the athlete's caption app and, through fictitious characters creation that represents real personas, named as André Machado, market analyst of bases category of Sport Club Internacional, and João Silva, a student that craves for being a soccer player. The analyst represents the primary persona, that is, the direct clients that generate revenues to Joinfut, and the player is the secondary persona, which benefits from the business model and feeds the database.

— André Machado has 25 years old, graduated in data Science and it is responsible for the recommendation and mapping of young players on Internacional. He thinks that some steps of the actual capitation process are still empirical and subjective, he understands that technology can be applied in all of them, basing the decision in making in real data. Also, he needs a platform that includes all important data for athlete selection and aspires to have a huge database that supports the decision. Feel guilty for being part of a little data-based process that, mostly, end up losing high-quality players, for not considering statistical aspects of the evaluation.

— João Silva has 15 years old, is a high school student in Porto Alegre, and longs for being a soccer player. Has experience in amateur soccer clubs and is unemployed. He believes that has the physical and technical potential for being a professional player, although he doesn't believe that is being perceived on selection trials, because has few minutes of showing his skills in the given opportunities. Feels devalued and distant from his dream, because he sees that his approval does not depend only on himself.

After the persona definition, the author contacted people that could represent them, to exploit their feeling against the problem, and with the proposed solution by the study. There were realized interviews with market analysts from soccer academies of Grêmio Football Porto-Alegrense and Sport Clube Internacional focusing on the primary persona approach, and with two ex-athletes with experience in this market. As a register of the main discussed points in the interview, there was attached the Appendix E for support. Desires, behavior, goals, and pains of the interviewed people were registered on the Empathy Map which, based on the interviews, showed the importance of the nearness between designer and users, and to action planning for customer service. The map is presented is shown in Appendix F.

As the main raised point with analysts, is highlighted the club's necessity of having simple athletes report, easy to manage and that allow the Generation of intuitive reports and fast to be reviewed, due to the intense routing of appraisers inside a club. It shows the importance to analysts also the athlete's filter according to their physical and technical characteristics, allowing them to rate based on young's yield, besides video presentation. To make it easier for appraisers' analysis, it is relevant to have a previous evaluation from Joinfut.

The players believe that the app can have athletes' adherence because the soccer market is subordinated to entrepreneurs' agency, difficulting entrance and turning the process bureaucratic and, beyond that, has short evaluations steps. As app desires was suggested IDB connection, which indicates athletes' historical on clubs and keeps updates constant, according to athletes' career changes.

3.2. Definition

The definition stage started with gathering and organizing raised information in the previous step. It Was compiled and organized in categories with support of the affinity Diagram. Altogether, amounted to twenty-five insights cards, which consists of persona's requirements.

According to the result of the survey information made in the immersion stage, was observed 3 distinct categories, being them: Process, access/opportunities, and people.

The process Field includes needs/aspects which involves the way how the selection is made, approaching involved variables. Inside of this category was designated two subcategories, referring involved resources, and performed investment. In this group was raised 17 cards.

Inside the access/opportunity group came together with the information that involves athletes' entrance in the market, detailing involved difficulties and encountered pains. Overall, this group received 6 insight cards.

The people group integrated information regarding problems which athletes face to be approved, particularly linked to this persona like, for example, discipline to stay focused on the goal of being a high-level athlete and the technical, physical, and intellectual valences to support all challenges that persist in the career. In this group, there were 2 cards from the immersion step.

As result, 68% of insights were related to the process category, 24% to the access/opportunity category, and 8% to the people group. It is perceived that the most demanded category to improvement opportunities is processed, as shown in Figure 3. From this, it was moved on to market research.
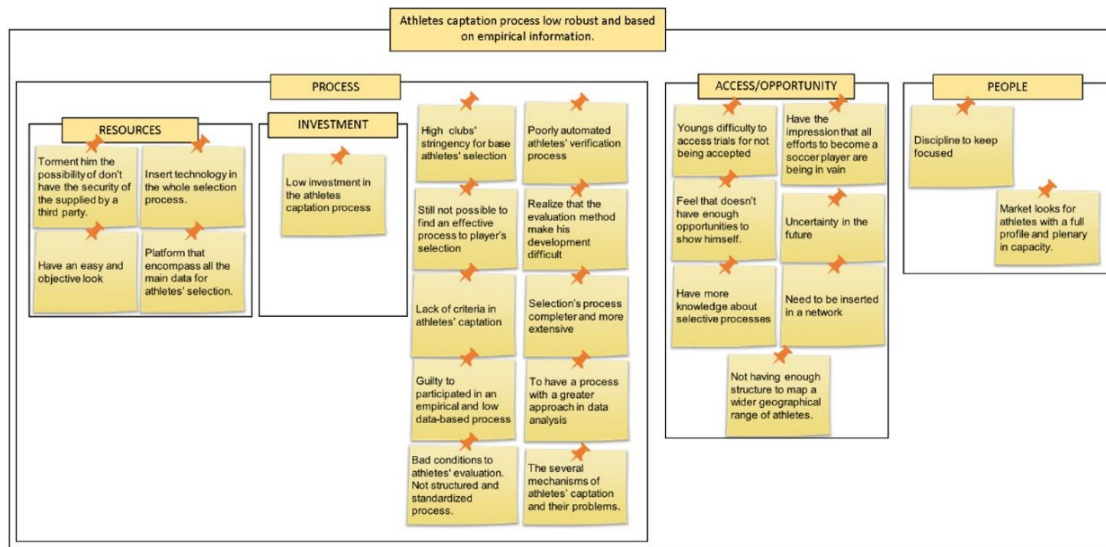
Figure 3. Affinity's Diagram. Source: Elaborated by the author.

The desk research was structured based on Affinity's Diagram results. The aspects of the questionnaire were targeted in the QFD tool, which was used in the posterior ideation stage. First, split up the primary level from the analysis in Business and Product, unfolding the information contained in the Diagram cards as components in the secondary level.

According to Bollela (2007), the primary level constitutes the demanded qualities more extensive, while the second level is achieved by unfolding the primary one. Therefore, there was noted that, in macro analysis, the app development has demanded qualities directed towards business and product, according to previously gathered information. The questions were generated from demanded qualities contained in the secondary level, we're focused on questions that attend both primary and secondary personas.

How the current work approaches the product development, was deepened by the author questionnaires results direct to the product level, do not consider business. The questionnaire was organized according to Appendix G. With the definition step completed, was moved on to the ideation step, which is exemplified in the following subsection.

3.3. Ideation

The ideation stage is based on the way how designer interprets the information about the problem and how he solves it. With this, through this stated point of view, the problem can be used as a "solution trampoline" to provide new components alternatives and create experiences with customers (Hasso-Plattner Institute of Design at Stanford, 2018).

Starting this step, the market survey results were placed in the QFD, to be identified the main quality items demanded by the target audience, who were the respondents of the same. There were generated 3 macro groups were into the product primary level, named "Player's Physical characteristics", "Player's technical characteristics" and "System", that represents the client's requirements, that is, app conditions that should be fitted in the product. The secondary level items were unfolded in persona's requirements characteristics in way of questions.

The realized survey has open and closed-ended questions, direct to customers. Each persona contributed with an important value that each item had according to your point of view. As Ribeiro et al. (2001), this survey has great importance in QFD, because its objective is to inquire and raise the relevance that the interviewed attribute to each second-level item. The importance scale was 1 to less important and 5 to more important.

As shown in Figure 4 the weighted average of identified weights identified between the soccer player persona and market analyst, originating the second part f the Quality's Matrix.

Client's requirements ↓	Characteristics	Average
Player's physical characteristics	Prevailing Leg	4.50
	General physical characteristics – Height, weight and BMI	4.02
	Speed, strenght and physical endurance	4.00
Player's technical characteristics	Player Position	4.62
	game characteristics and space interpretation (offensive, defensive)	4.35
	Most important General Technical characteristics – as kick, pass, ball controll and header	4.10
System	interconnection with federations database	5.00
	Robust system of information's security.	4.78
	Provide to clubes the possibility of reports generation	4.78
	Product's mix (besides offering the database)	4.67
	Platform that enable filters that make the athletes research easier, according to their physical and technical characteristics	4.63
	Built-in trial's calendar in the app	4.62
	Easier registration - by log-in in social media, but with ITR verification for veracity	4.62
	Simple, intuitive and easy to handle platform.	4.54
	Multiplatform - Web and App	4.52
	English and spanish tool to make the international registration easier	4.44
	Allow the subgroups creation through the main database	4.44
	Video registration for technical and physical athletes characteristics	4.41
	Inlaid classification in the athletes' information according to Joinfut's analysts pre evaluation.	4.38
	Big data usage	4.22
	iteractve social media	3.85

Figure 4. Market research results. Source: Elaborated by the author.

According to the results shown in Figure 4, it is possible to analyze the voice of the customer. The contained characteristics in the system group were the ones that presented, on average, the higher weight in the persona's point of view. This group embraces the following characteristics: built-in app trial schedule, eased registration with ITR (individual taxpayer registry) verify; English and Spanish tools to make it easy the international registrations; offering a mix product, that is, offering different products from the original one; interconnection with the IDB database; Supply of a sturdy system in information security; the possibility of reports Generation; filters to facilitate the Search for athletes; Supply of a simple and intuitive platform; Web and App multiplatform; Permission to create subgroups through the main database; Video registration to visualize athlete behavior; Joinfut Pre-classification attached to players reports; iterative social media; Big data usage.

The most important item on the client's thinking was "System – interconnection with federations database" weighted as 5.00 and the less important was "system – interactive social media", which received a weight of 3.85. In this class, the client makes it evident the relevance of athletes being linked to the IDB, showing that experience in clubs truly aggregates in the approving process.

In the analysis of the group "Physical athletes characteristics", the personas prioritize the item "prevailing leg", with the weight of 4.5, followed by "General physical characteristics – Height, weight and BMI", with 4.02 and "Speed, strength and physical endurance", with 4 points. In the class "Player's technical characteristics", the most important considered item was "player position", with 4.62, followed by "game characteristics and space interpretation, with 4.35, and "Most important General Technical characteristics – as kick, pass, ball control and header", with 4.10.

From these checks, was possible to map the main attributes to be raised to Quality's Matrix development. Therewith, it is observed that the personas desire to have at their full disposal the basic technical elements of an athlete inside the game, as well as their physical conditions.

As requirements of the Matrix Project, there was defined the strategical actions that add value to the product, that is, the technical characteristics of quality that aggregate the app. There was defined from the realized survey and designer experience. The characteristics are presented in Figure 5 and are confronted with the demanded quality items by the client, correlating them with a scale of 1, 3, and 9. The correlation 1 presents a low ratio between the variables and 9 a high ratio, and 3 an average ratio.

The research results are represented by the values of IDI in the Quality Matrix. To prioritize them must be considered the competitive and strategical evaluation because They allow to incorporate into QFD aspects that could not be directly highlighted by customers (Ribeiro et al, 2001). According to the same author, future trends that clients still don't foresee, or strategic guidelines may be considered for the IDI* composition.

Chart 1 presents the Quality's Matrix with the item's importance distributions according to the survey results, in conjunction with their corrected values, from the strategic and competitive evaluation. The scales used for each evaluation are in Appendix H.

Chart 1. QFD Quality's Matrix.

Importance to customer	1 - Online platform that presents to clubs at least 15 decision variables to athletes evaluation and selection	2 - Have the records system a 100% with athletes' videos	3 - Show, on average, 10 current trials per month	4 - Allow that the platform interact with social media, making the record easier and hitting athletes from different origins.	5 - Have a authenticated database according to registration information (IDB and ITR)	6 - Installation of a consistent Blockchain system.	7 - Have, at least, 3 tools that make the selection process easier, increasing it's efficiency	IDI	Ei	Mi	Idi*
Prevailing Leg	9	3						4.50	1.5	1	5.511
General physical characteristics – Height, weight and BMI	9	1						4.02	1	1	4.020
Speed, strenght and physical endurance	9	9						4.00	1.5	1	4.899
Player Position	9	9						4.62	1.5	1	5.658
game characteristics and space interpretation (offensive, defensive)	9	9						4.35	1	1	4.350
Most important General Technical characteristics – as kick, pass, ball controll and header	9	9						4.10	1.5	1	5.021
Built-in trial's calendar in the app			9					4.62	1	1	4.620
Easier registration - by log-in in social media, but with ITR verification for veracity		1		9	9	3		4.62	1	0.5	3.267
English and spanish tool to make the international registration easier				1				4.44	1.5	0.5	3.845
Product's mix (besides offering the database)	1	3						4.67	0.5	0.5	2.335
interconnection with federations database	3				9	3	3	5.00	2	0.5	5.000
Robust system of information's security.				1	3	9		4.78	1.5	1	5.854
Provide to clubes the possibility of reports generation	3	3			1		9	4.78	2	1	6.760
Platform that enable filters that make the athletes research easier, according to their physical and technical characteristics	9				3		9	4.63	2	1	6.548
Simple, intuitive and easy to handle platform.	1	1	1				3	4.54	2	1	6.421
Multiplatform - Web and App			1	1	1	3	1	4.52	0.5	1	3.196
Allow the subgroups creation through the main database	9	1			1	1	9	4.44	1.5	1	5.438
Video registration for technical and physical athletes characteristics	3	9					9	4.41	2	1	6.237
Inlaid classification in the athletes' information according to Joinfut's analysts pre evaluation.	9	9				1	9	4.38	1	1	4.380
Big data usage	9	1		1	3	9	9	4.22	2	1	5.968
iteractve social media				9		1		3.85	1	0.5	2.722
IQj	528.89	336.84	58.20	72.77	144.91	153.33	355.43				
(Dj)Competitive analysis	0.5	0.5	1.5	2	0.5	0.5	0.5				
(Bj)operation's difficulty	1	1	1	1	0.5	1	1				
Quality features importance IQj*	373.98	238.18	71.28	102.91	72.45	108.42	251.33				

Source: elaborated by the author.

For the product main characteristics analysis, were considered Only IDI* values, because bring into line the most important items for the clients with the strategical charging for them to the company. For the results, was made a cut line for the items with a low ratio below four points because, according to the importance scale above, the items are Only considered as important with an equal or higher ratio.

To finish the ideation step, the product's components action plans were organized supported by the 5W2H and Concept's Catalog tool (this last executed in the prototyping step). Chart 2 presents the action planning with the product requirements.

Chart 2. 5W2H as actions planning.

Type	Requirement	Classify	Idi*	What ?	Who ?	When ?	Where ?	Why ?	How ?	How Much ?
System	Provide to clubs the possibility of reports generation	1	6.76	Create a visual that presents the physical and technical info from the selected athlete	Project's development team	At the time of product prototyping	In the software	Aggregate value to the product and make the decision making easier	Programming the app	-
System	Filter of technical and physical characteristics	2	6.55	Activating filters that segment database information according to needs	Project's development team	At the time of product prototyping	In the view for the customer (club) and also on the athlete registration screen	Are essential components to athletes evaluation	Programming the app	-
System	Simple, intuitive and easy to handle platform.	3	6.42	Put the main selection info in a clear and simple way to user	Project's development team	At the time of product prototyping	In the software	It is primordial to the client to have an agile app, easy to visualize, allowing to analyse the main athletes data.	Planning the App's programming	-
System	Video's Registration	4	6.24	Create a video upload area in the moment of athletes registration	Project's development team	At the time of product prototyping	In the view for the customer (club) and also on the athlete registration screen	It is important to athletes' selection to visualize his video, to analyse his behavior inside the gaming field.	Programming the app	-
System	Utilização do Big Data.	5	5.97	Generate a big database with athletes information	Project's development team	At the time of product prototyping	In the database structure	The information base with athletes data will be in a big database which will be recurrently fed with athletes records. The same will be fowarded to clubs and it is an important component in the process	Programming the app	-
System	Robust system of information's security.	6	5.85	Hire a consistent database security system	Business's owner	-	In the software	It is important to establish and plan a consistent security system, to assure that the data used by clubs does not leak.	Service contracting	-
Player's technical characteristics	Player Position	7	5.66	Add this characteristic in the information filter to analysis	Project's development team	At the time of product prototyping	In the software	Are very important information to athletes's selection	Inserting selection filters	-
Player's physical characteristics	Prevailing Leg	8	5.51	Add this characteristic in the information filter to analysis	Project's development team	At the time of product prototyping	In the software	Are very important information to athletes's selection	Inserting selection filters	-
System	Subgroups Creation	9	5.44	Creation of a grouping tool of the athletes' characteristics, according to analysts demand.	Project's development team	At the time of product prototyping	In the software	For the club to be able to group athletes according to their characteristics, it is important to have this tool and provide it to clubs	Programming the app	-
Player's technical characteristics	General technical characteristics	10	5.02	Add this characteristic in the information filter to analysis	Project's development team	At the time of product prototyping	In the software	Are very important information to athletes's selection	Inserting selection filters	-
System	interconnection with federations database	11	5.00	Data Connection tool with CBF's IDB database	Project's development team	At the time of product prototyping	In the software	In order to add value to the athlete's selection, it is important to have communication between the CBF IDB data, so that the history of links between the same and soccer clubs can be analyzed.	Programming the app	-
Player's physical characteristics	Speed, strenght and physical endurance	12	4.90	Visualization of the recommended variables. Because of the characteristics, will be shown on videos	Project's development team	At the time of product prototyping	In the software	Are very important information to athletes's selection	Inserting selection filters	-
System	Built-in trial's calendar in the app	13	4.62	Built-in trial's calendar in the app (will be fed monthly)	Project's development team	At the time of product prototyping	In the software	Agrega valor ao cliente atleta	Programming the app	-
System	Built-in pre evaluation	14	4.38	Create a field to visualize analysts pre evaluation (with grades of 1 to 5)	Project's development team	At the time of product prototyping	In the software	It is important to clube to have pre evaluations inlaid in the app. This evaluations will be made by Joinful's analysts	Inserting visualization's buttons	-
Player's technical characteristics	game characteristics and space interpretation (offensive, defensive)	15	4.35	Add this characteristic in the information filter to analysis	Project's development team	At the time of product prototyping	In the software	Are very important information to athletes's selection	Inserting selection filters	-
Player's physical characteristics	General physical Characteristics	16	4.02	Add this characteristic in the information filter to analysis	Project's development team	At the time of product prototyping	In the software	Are very important information to athletes's selection	Inserting selection filters	-

Source: elaborated by the author.

As main planning items can be highlighted the creation of visualization that presents player physical and technical information, the activation of filters that segment the information of the database according to necessity, and the creation of an upload area to videos attached to the players report. For all quoted items, the product development team will be responsible for the creation of the components, will be made during the product development step, and are justified as tools that aggregate value to the customer for helping them on their decision making, they are essential to athletes' evaluation, besides presenting the athlete's behavior inside the game.

The 5W2H provided to the author to structure, analyze and prototype the way how the items should be distributed into the product, considering them responsible for the execution, the considered motives, and the degree of importance to each one in the context.

3.4. Prototyping

According to Hasso-Plattner Institute of Design at Stanford (2018), prototyping has been constantly thought of as a way of? the solution's functionality, seeking gains in empathy with the *Personas*, exploring demanded needs, testing the structured solutions, and design inspiration. For the author, the prototypes, get more success when all the *stakeholders* involved may experiment and interact with them.

To define how the components of the product would be distributed and built, according to the rank based on IDI* of each requirement, the requirements were put into the prototypes in the concept catalog and the action plans were useful to be based for structuring the shape of the components. Besides planning and ranking the actions, some figures were added, to aid the visual of the final prototyping and to get a paper sketch idea of the final prototype components. Figure 5 and Figure 6 shows the most important components. They were hand-drawn.
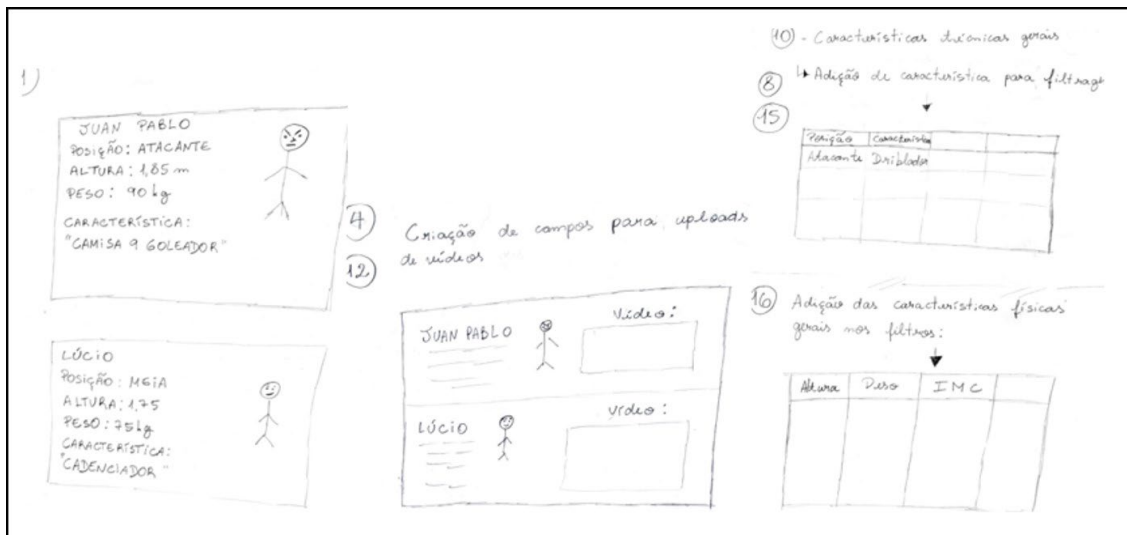
Figure 5. Paper prototypes of final product components. Source: Prepared by the author.

Figure 6. Paper prototypes of final product components. Source: Prepared by the author.

With this context in mind, the penultimate step focused on doing the product's final prototype and accomplishing the risk analysis of the app, because it's gotten to verify how all the requirements were placed within the product. Using the concept catalog as a parameter, which was represented in the prototypes on sheets of paper, prototyping was developed in the design platform Marvel *App*.

It's important to highlight that all the App pages were designed, both for the visualization of the players and for the visualization of the clubs, embracing the brand logo, registration, and even the Data Analytics. The final prototype with the screens shows up in Figure 7. The prototype can be accessed at the following link: at the link referred as marvel app in the references.
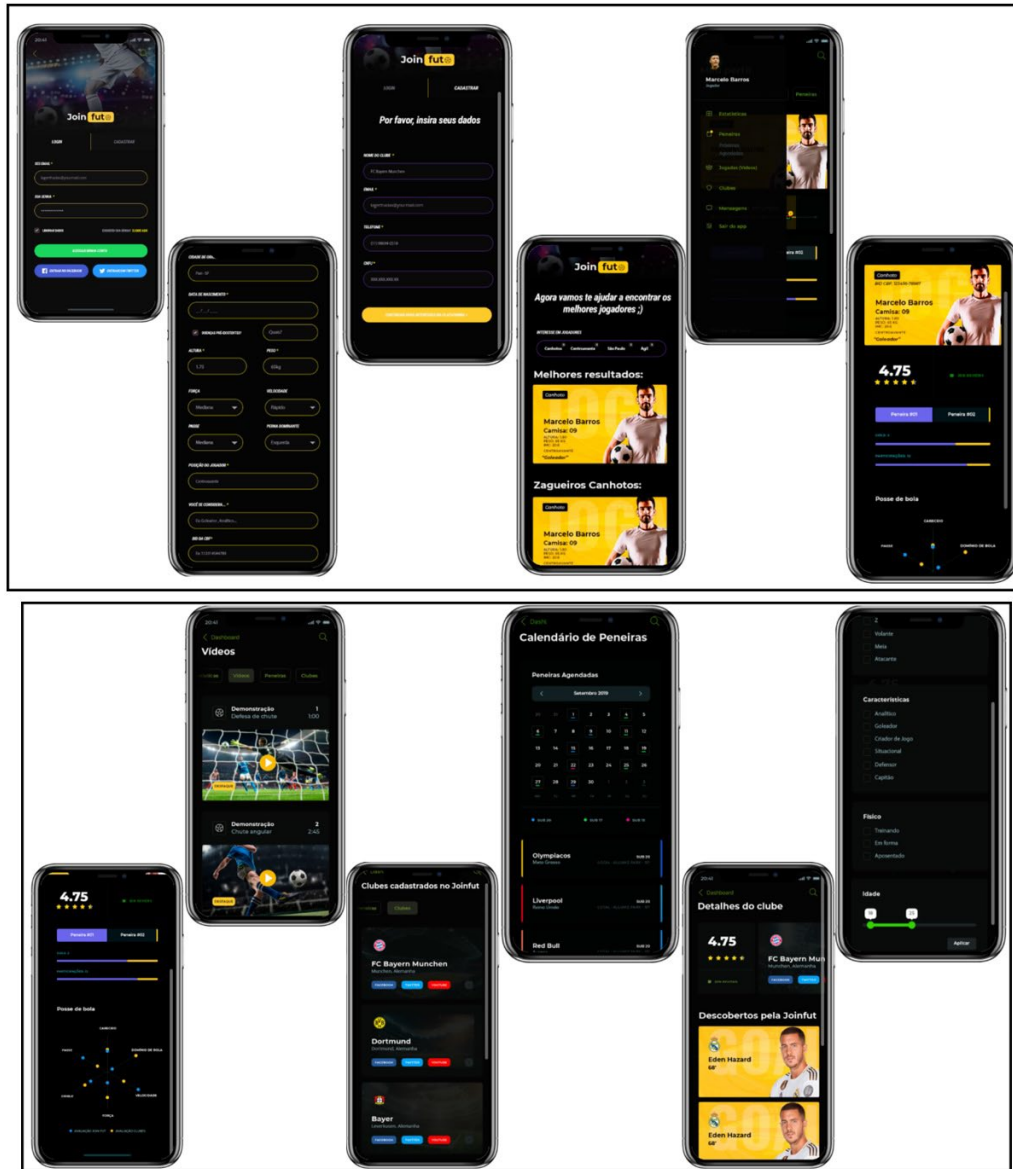
Figure 7. Final prototype. Source: Prepared by the author.

The prototype that was created allows users to generate reports with the main features of the athletes filtered according to the demands of the analysts, as a dominant leg, height, weight, and BMI, embracing some physical characteristics, position, and game characteristics, representing all the technical characteristics. Besides all these points, from their needs, the app allows the creation of subgroups that follow the athletes pre-selected by the clubs, to those clubs get the group the data according to the defined selection. For instance, if the analyst wants a "defender" who has the characteristic "left-legged", he/she gets grouping those data within this filtering.

The report also allows visualizing videos of the players, their punctuation according to pre-evaluation that has been done by the JoinFut's analysts and the ID of CBF (Brazilian Soccer Confederation). These functionalities allow the analysts to accomplish huger and more robust evaluations that will help them to make better decisions.

The players can verify the calendar of evaluations to apply themselves in there, according to its requirements.

For gathering the risks of components, it was done the evaluation of FMEA for the app the analysis concentrated itself to gather the main potential problems of the system that the app will have. Figure 8 shows the risk analysis verified for the components.

Type	Component	Failure	Effect	Sev./Grav	Cause	Occur.	Control	Detec.	Risk	Action	Responsible Deadline
System	Information tool with the main player data	Error in the information reported to the customer	Clubs will have data with errors for data analysis; Athletes will have incorrect data in their performance report	4	Data typing error; System failures	7	Checking and inspecting the information to verify the veracity of the data	9	252	Inspection/data checking	Product development team; Product maintenance team
System	Information security	Deleted Data, Data Intrusion, Data Break;	Legal issues involved; Loss of database data - Financial problems resulting from this.	9	Failure to plan and execute data security at every step of the application.	5	Establish a micro data security plan for each step of the process execution	5	225	Hiring programmers specialized in data security to focus on development at each security step.	Product Development Equipment
System	Reports generated	Pulling incorrect information due to system error;	Unfeasible to use the functionality; Decrease in brand reliability; lost revenue	10	Development failure, requirement failure, system architecture failure, and/or test failure.	5	Standardization and control of the development of the internal programming of the application's components.	4	200	Perform automatic tests to guarantee the tool. Establish a great development time for the product.	Product Development Equipment
System	Pre-assessment tool for each player	Pull Incorrect Reviews	Non-compliance of the data collected, incurring in a broken assessment process.	9	Development failure, requirement failure, system architecture failure, and/or test failure.	5	Perform automatic and programmatic tests to guarantee the full functioning of the tool.	4	180	Plan tool testing; Establish and schedule a great product development time.	Product Development Equipment
System	Selection filters	Pulling incorrect information due to system error.	Unfeasible to use the functionality.	10	Development failure, system architecture failure and/or test failure	5	Controls and management of automatic tests to guarantee the full functioning of the tool.	3	150	Plan tool testing; Establish and schedule a great product development time.	Product Development Equipment
System	Video Upload System	Shooting issues with video format. Problems with integration with third party system.	Unfeasible to view the video	10	Video format and integration failure with third party server system with application	5	Control and management of the development team as a server	3	150	Hire a powerful server to shoot the videos. Restrict the format of videos to mp3 or mp4	Product Development Equipment
System	Large database	Safety: Data leakage	Legal issues involved, Data Loss - Financial Problems Recurred	10	Architectural failure, security failure, development failure.	5	Establish a standard of security in the service.	5	150	Development team needs to establish a security standard in the service.	Product Development Equipment
System	Internal system that allows the grouping of information	Pulling incorrect information into the cluster due to system errors.	Unfeasible to use the functionality.	10	Development failure, requirement failure, system architecture failure and/or test failure	5	Perform automatic and programmatic tests to guarantee the full functioning of the tool.	3	150	Plan tool testing; Establish and schedule a great product development time.	Product Development Equipment
System	Data connection tool with sports federation databases	Communication between databases; Security issues with third party system.	Faulty and disconnected/inaccessible functionality	6	Third party system updates/changes;	8	There is no control over this process	1	48	Contact the company; have a continuous monitoring system between the two businesses.	Product Development Equipment

Figure 8. Product's FMEA. Source: Prepared by the author.

It was realized that the potential failures with higher scores referred to "Informative tool with key player data" and "information security".

The first one deals with the data errors that are reported to the customers, which can be caused by users' typing errors and system failures. This failure had a score of 252. To mitigate it, the researcher thought of an action to inspect and verify the data, which will be delegated to the product development & maintenance team.

The second issue with the highest score was the one that deals with the risk of the product having data hacking, which is a common problem on IT products like this one. It's also a product with huge data load circulating in the network and it's another reason why this issue happens a lot. To mitigate it, security planning was established as a control to each step of the app, from the register to the delivery to the final customers, soccer teams, and athletes. As an action for it, the researcher indicates hiring specialized programmers in data security.

It's also important to highlight the issue with the lowest score in the FMEA Analysis which is the functionality that shows up athlete CBF BID information from all the registered and federated athletes. It's important to mention that this component is one of the most important features for the teams. It deals with the communication between the whole database involved, where the problems with data security of the auxiliary database (CBF BID) are not covered and managed by the JoinFut work team. It's such an easy issue to identify and, because of that, it has a low score. To mitigate it, an action to create a continuous monitoring system was proposed and it would involve both of those systems. Joinfut and CBF would have a partnership and it would demand great and constant communication between their Product development and maintenance departments for accomplishing some related tasks.

3.5. Test

After finishing the prototype and gathering the potential mapped fails, the app was developed on screens. The app was presented to eight stakeholders involved in the business proposal, to seek the goal to accomplish the simulation at the same virtual environment and, after that, evaluate its features, through a survey. The test consisted of applying a second questionnaire to evaluate the app. The model was presented virtually to Personas on the platform on which it was developed, called the Marvel App and, in parallel, they were able to evaluate it in the questionnaire.

Based on the survey results, it was possible to retrieve the quantitative and qualitative feedback from users and visualize the opportunities for improvement identified.

It was possible to analyze the aspects with the best evaluation and which should be improved, considering that the prototype was made in the first round of analysis.

When verifying the results, it was noticed that the survey was answered by two football analysts and six former football players, that is, all with great experience in the sporting environment.

The research carried out understood the requirements raised. For the measurement, as in the market research, it was parameterized from 1 to 5 the degree of user satisfaction with the results. Thus, 1 represents a very low degree of satisfaction, and 5 represents a high degree of satisfaction. Chart 3 presents the arithmetic mean of the results according to the degree of satisfaction.

Chart 3. Results of the application of the final prototype usability test.

Requirement number	Requirement Question	Arithmetic Average (scale from 1 to 5)
1	What is your degree of satisfaction with the way the athletes' physical characteristics were presented?	4.625
2	How satisfied are you with the way the technical features were shown?	4.875
3	How satisfied are you with the way in which the pre-assessment carried out by JoinFut and the clubs on the performance of the players was presented?	4.625
4	How satisfied are you with the way the sieving schedule was shown?	4.75
5	How satisfied are you with the way the BID code was laid out and its link with the player?	4.875
6	How satisfied are you with the way in which the filters applied to verify athletes were presented?	4.75
7	How satisfied are you with the way the athletes' videos were presented?	4.875
8	How satisfied are you with the way the filters were presented?	4.75
9	How satisfied are you with the way the reports were arranged in the app?	4.875
10	How satisfied are you with the way the subgroups were presented in the app?	4.75

Source: Prepared by the author

It is noticed that, in general, the prototype was well accepted by users, who posted important information to improve the product. The requirements that had the worst result in the assessment – which refer to the way the players' physical characteristics were distributed and the built-in pre-assessment of the analysts – were placed in the prototype, as it was known that they are extremely important to the customers. About the first item mentioned, customers stated that physical characteristics are not 100% reliable, and this fact limits the scope of selection and recruitment of athletes, in addition to missing the athletes' birth date. Regarding the second point, it was stated that the prior analysis is important for those responsible for the uptake, despite being subjective at first, from the first evaluation.

Another important point raised in the research is related to filters. There was a need for users to filter the origin of athletes, presenting in the application the state where the player lives, so that clubs can segment them by state.

4. Final considerations

Considering the current need of clubs and athletes to use software that facilitates the process of attracting and selecting athletes, the work carried out aimed to apply Design Thinking to develop an application that delivers this service. The proposal was achieved, as the study generated a prototype that meets the main quality requirements generated by the analyzed Personas and potential product improvements. Regarding the defined specific objectives, it is understood that they were also efficiently achieved, considering that the designer prototyped, tested, and validated the solution with stakeholders. In addition, improvements suggested by them were raised.

The application of the Design Thinking methodology was carried out as planned. It was noticed that the method can be applied to various studies that aim to study the feasibility of new market entrants and to develop innovation within existing products and services. Due to the low possibility of high investment, it was not

possible to make real software, limiting itself to the virtual prototype. Thus, for future work, it is suggested to carry out the real prototype of the application with the improvements raised in the test stage.

As a result of this, the second round of DT development could be done to improve the software performance in a real environment.

5. References

Akao, Y. (1996). *Introdução ao Desdobramento da Qualidade*. Belo Horizonte: Fundação Christiano Ottoni, Escola de Engenharia da UFMG.

Almeida Bastos, A. L. (2006). *FMEA (Failure Mode Effect and Analysis) como ferramenta de prevenção da qualidade em produtos e processos - Uma avaliação da aplicação em um processo produtivo de usinagem de engrenagem.* Encontro Nacional da Engenharia de Produção. ENEGEP.

Alves, A. T., Lima, A, M. L., Sales, E. O., & Da Costa, S. A. J. (2014). *Relato da Aplicação da Metodologia Design Thinking no Projeto de um Software para Mobilidade Urbana*. In *Anais do Simpósio Brasileiro de Sistema de Informação*. SBC.

Bedin, J., Bertotti Da Silva, S. P., & Cândido, A. C. (2017). O Potencial das Ferramentas Atuais de Gestão & Negócios Aplicados às Unidades de Informação. In *Anais do XXVII Congresso Brasileiro de Biblioteconomia, Documentação e Ciência da Informação*.

Bertolo, D. L., Zanotto, M., Marchalek, A. L., Fachinelli, A. C., Neto, O., Almeida, D., Camilo, T., Ribeiro, A., & Rodrigues, G. (2015). *Metodologia Design Thinking - Proposta de Um Aplicativo para o Transporte Coletivo Urbano na Cidade de Caxias do Sul*. Caixas do Sul: Programa de Pós-Graduação em Administração, Universidade de Caxias do Sul.

Bezerra, M. B. P. (2007). *Mapeamento da Usabilidade do Produto através do Diagrama de Afinidades*. In *Anais do Encontro Nacional de Engenharia de Produção*. ABEPRO.

Bollela, A. V. (2007). *Aplicação do QFD em Gerenciamento de Projetos de Instalações Industriais*. In *Anais do XXVII Encontro Nacional de Engenharia de Produção*. ABEPRO.

Brown, T., & Katz, B. (2010). *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*. New York: Harper Business.

Cheng, L. C. E., & Melo Filho, L. D. R. (2007). *QFD – Desdobramento da função qualidade na gestão de desenvolvimento de produtos*. São Paulo: Editora Blucher.

Ernst & Young. (2019). *Impacto do Futebol no Mercado Brasileiro*. Rio de Janeiro: Confederação Brasileira de Futebol-CBF.

Cota Júnior, M. B. G., & Cheng, L. C. (2006). *Aplicação do QFD e do PCP aprodutos digitais em uma empresa brasileira de telecomunicações móveis*. Belo Horizonte: UFMG.

Cunha, M .A. G. (2000). *Desdobramento da Função Qualidade no Setor de Lazer: O Caso do Petrópole Tênis*. Porto Alegre: Universidade Federal do Rio Grande do Sul.

Doering, L. (2018). *Softwares e Aplicativos de Análise de Desempenho – Parte 1*. MW Futebol.

Erthal, J. M., & Lemos, R. (2010). *Sonho de muitos, chance para poucos*. Revista Veja.

Estanislau, A. (2016). *Comparação de diferentes sistemas de análise de desempenho no futebol: Proposta na utilização do software*. Unicamp.

Fernandez, A. (2019). *Sobre desk research*. Ux Change.

Ferreira, M., & Ghiraldello, L. (2014). *O Benchmarking como ferramenta de gestão: Um estudo em departamentos de viagens corporativas nas empresas*. Belo Horizonte: Pontifícia Universidade Católica de Minas Gerais (PUC-MG).

Herzwurm, G., & Schockert, S. (2003). The leading edge in QFD for software and electronic business. *International Journal of Quality & Reliability Management*, *20*(1), 36-55.

Lopes, L. A. (2018). Como se tornar um jogador de futebol? *Revista Super Interessante*.

Marvel App. https://marvelapp.com/prototype/f4g712e/screen/73373116. Data de acesso: 01 de dezembro de 2020.

Moura, H. V. (1997). *A Evolução do Futebol através da Ciência e da Tecnologia*. Universidade de Taubaté.

Nielsen Company. (2018). *Nielsen's World Football Report*. Nielsen Company.

Palady, P. (1997). *FMEA – análise dos modos de falha e efeitos: prevendo e prevenindo problemas antes que ocorram*. São Paulo: IMAN.

Peixoto, M. O. C., & Carpinetti, L. C. R. O, (1999). *QFD como facilitador da engenharia simultânea*. In *Primeiro Congresso Brasileiro de Gestão de Desenvolvimento de Produto*, Belo Horizonte, 1999. Anais do *Primeiro Congresso Brasileiro de Gestão de Desenvolvimento de Produto*., 1999.

Plattner, H. (2018). *Design Thinking Bootleg*. Institute Of Design Thinking, Stanford University.

Reis, L. V., Silva, A. L. E., Corbellini, R. H., & Rabuske, F. B. (2016). *O Uso das Ferramentas Brainstorming e 5W2H no Planejamento de Combate a Incêndio em Indústrias de Tabaco*. In *Encontro Nacional de Engenharia de Produção*. ABEPRO.

Ribeiro, J. L. D., Echeveste, M. E., & Danilevicz, A. M. F. (2001). *A Utilização do QFD na Otimização de Produtos, Processos e Serviços* (Série Monográfica Qualidade). Porto Alegre: FEENG/PPGEP/UFRGS.

Rodrigo, J. (2008). *Estudo de caso - Fundamentação teórica*. Brasília: Vestcon.

Rosa, S. E. M. (2009). *Aspirante a craque de futebol hoje ou marginal do amanhã?* Sorocaba-SP: Faculdade Anhanguera.

Rossi, V. C. A., & Slongo, A. L. (1998). *Pesquisa de satisfação de clientes: o estado-da-arte e proposição de um método brasileiro*. *RAC. Revista de Administração Contemporânea*, *2*(1), 101-125.

Russo, C. R. (2008). *Marketing esportivo*. Brasília: Centro Universitário de Brasília.

Serviço Brasileiro de Apoio às Micro e Pequenas Empresas – SEBRAE. (2016). *10 ferramentas para validar e executar novas*. Retrieved in 2020, August 16, from https://www.sebrae.com.br/sites/PortalSebrae/artigos/10-ferramentas-para-validar-e-executarnovas-ideias,c30d9594aaff6510VgnVCM1000004c00210aRCRD

Silbermann, M. (2010). *Jogador-Informação: Uma etnografia dos usos de tecnologias informacionais no incremento do desempenho de jogadores de futebol*. Porto Alegre: Universidade Federal do Rio Grande do Sul.

Silva, A. A., Silva, N. S., Barbosa, V. A., Henrique, M. R., & Baptista, J. A. (2011). A Utilização da Matriz SWOT como ferramenta Estratégica – um Estudo de Caso em uma Escola de Idioma de São Paulo**.** In *Anais do VIII Simpósio de Excelência em Gestão e Tecnologia*. UFSC.

Silva, E. L., & Menezes, E. M. (2001). *Metodologia de Pesquisa e Elaboração de Dissertação*. Florianópolis: Universidade Federal de Santa Catarina.

Silva, M. A., Correa, C. S. A., Filho, M. R. S. J., & Souza, A. C. R. (2016). *Aplicação do design thinking em um problema educacional: um relato de experiência*. Recife: Departamento Estatística e Informática (DEINFO), Universidade Federal Rural de Pernambuco (UFRPE).

Universidade do Futebol – UF. (2017). *Futebol de Base: Um diagnóstico estrutural e financeiro do processo de captação de atletas em clubes de futebol do Brasil*. São Paulo: UF.

Vetterli, C., Brenner, W., Uebernickel, F., & Petrie, C. (2013). *Why Requirements Engineering Needs Design Thinking*. March/April.

Vianna, M., Vianna,Y., Adler, K. I., Lucena, B., & Russo, B. (2012). *Design Thinking – Inovação em Negócios*. Mjv Press.

Appendix A. FMEA.

To use the FMEA, it is necessary to look for the values in the severity, occurrence, and detection tables. The definition of the severity index is linked to the effects of failures on the product's functions, that is, its use. The occurrence indices are defined by the probability of a cause occurring during its use. As ways to reduce these failures, it can be considered the intensification of prevention of the causes or even the implementation of changes in the project. The detection index shows whether the control method can identify errors in the process or product. The more concern, investments in prevention equipment and tools, the lower the final value of this item becomes. The figure below shows the rankings for these indices.

Process Step / Input	Potential Failure Mode	Potential Failure Effects	SEVERITY	Potential Causes	OCCURRENCE	Current Controls	DETECTION	RPN
What is the process step and Input under investigation?	In what ways does the Key Input go wrong?	What is the impact on the Key Output Variables (Customer Requirements)?		What causes the Key Input to go wrong?		What are the existing controls and procedures (inspection and test) that prevent either the cause or the Failure Mode?		

Detection	Criteria: Likelihood the existence of a defect will be detected by process controls before next or subsequent process, or before product leaves the processing location.	Ranking
Almost Impossible	No known control(s) available to detect failure mode.	10
Very Remote	Very remote likelihood current control(s) will detect failure mode.	9
Remote	Remote likelihood current control(s) will detect failure mode.	8
Very Low	Very low likelihood current control(s) will detect failure mode.	7
Low	Low likelihood current control(s) will detect failure mode.	6
Moderate	Moderate likelihood current control(s) will detect failure mode	5
Moderately High	Moderately high likelihood current control(s) will detect failure mode	4
High	High likelihood current control(s) will detect failure mode	3
Very High	Very high likelihood current control(s) will detect failure mode	2
Almost Certain	Current control(s) almost certain to detect failure mode. Reliable detection controls are known with similar processes.	1

Effect	Criteria: Severity of Effect	Ranking
Hazardous – without warning	May endanger consumer. Very high severity ranking when a potential failure mode affects fitness for use and efficacy of product and/or noncompliance with government regulation. Failure will occur without warning.	10
Hazardous – with warning	May endanger consumer. Very high severity ranking when a potential failure mode affects fitness for use and efficacy of product and/or noncompliance with government regulation. Failure will occur with warning.	9
Very High	Major impact upon product flow and/or probability of acceptance. 100% of product may have to be scrapped. Product is nonfunctional. Consumer very dissatisfied.	8
High	Minor impact upon product flow and/or probability of acceptance. A portion of the product (<100%) may have to be scrapped. Product is functional, but at a reduced level (e.g., cosmetic defects). Consumer dissatisfied.	7
Moderate	Minor impact upon product flow and/or probability of acceptance. A portion of the product (<100%) may have to be scrapped. Product is functional, but at a reduced level (e.g., cosmetic defects). Consumer experiences discomfort.	6
Low	Minor impact upon product flow. 100% of the product may have to be reworked. Product is functional, but at a reduced level. Consumer experiences some dissatisfaction.	5
Very Low	Minor impact upon product flow. The product may have to be sorted and a portion (<100%) reworked. Cosmetic defects noticed by most consumers.	4
Minor	Minor impact upon product flow. A portion of the product (<100%) may have to be reworked. Cosmetic defects noticed by consumers.	3
Very Minor	Minor impact upon product flow. A portion of the product (<100%) may have to be reworked. Cosmetic defects noticed by discriminating consumers.	2
None	No effect	1

Source: SSDSI – How to complete an FMEA

Appendix B. Desk Research register with companies.

For the use of the Desk research, the author sought to carry out a large survey of material available to the public. All information was searched on the internet. As shown in the image below, the author verified articles, published works, and articles from newspapers and magazines. The Desk proved to be a good alternative for the compilation and systematization of knowledge, to drive the generation of insights. The Desk Research survey serves to indicate trends about the problem within *Design Thinking*.

Source: Made by the author.

Apêndice C. *Benchmarking* **register with companies.**

To accomplish the Benchmarking process with the companies, comparisons were established between them considering technical attributes of the available applications. According to the table below, the attributes are divided into business and product aspects, where the comparison parameters were determined as follows: Parameter "S" – The product has the attribute; Parameter "N" – The product does not have the attribute; Parameter "+" – The attribute is consistent within the product; Parameter "-"– The attribute is not consistent within the product.

Market	User Profile		Soccer Market	Soccer Market	Soccer Market	-> Next Step: JoinFut Assessment
Product	Digital Platform		REDE DO FUTEBOL	wit soccer	★	
Technology		Approach	Web Platform and App	Web Platform and Presential	App	Analysis of results for the realization of the SWOT Matrix
		Technical skills	S: Have N: Does not have +: Major -:Minor			
	Business Tools	1. Multiplatform	S	N	N	
		2. Product Mix	S	N	N	
		3. Customer Proximity	-	+	++	
		4. Pre-assessment	N	S	S	
		5. Geographic scalability	++	-	+	
	Product Tools	6. Use of Big Data	S	S	S	
		7. Reporting	S	S	S	
		8.Filters	S	S	S	
		9. ata Privacy	-	+	+	
		10. Product Modularization	S	N	N	
	Others	11. User Experience Rate	-	9,2	8,4	

Source: Made by the author.

Appendix D. Persona Definition.

The behaviors of the defined Personas were explained in detail. With this understanding, the author was able to understand the pains and needs of the target audience, so that the development of the future prototype would consider them as important insights and inputs.

Source: Made by the author.

Appendix E. Interviews with representatives.

The record included the contents discussed in the interviews carried out with the target audience, which represents the Personas. With the football analysts, the needs of the previously defined technical attributes were raised. With the players, the main features that the product will have been outlined. The images below present, respectively, the records with the analysts and the players.

Market		Customer Profile	Soccer Market	Soccer Market	Next Step:
		Team	GRÊMIO	S.C. INTERNACIONAL	
Technology		Profession	Market Analyst	Market Analyst	Analysis of results for the implementation of the Empathy Map
		Technical Tools:	S: Necessary N: not necessary		
	Business Tools	Multiplatform	N	N	
		2. Product Mix	N	N	
		3. User proximity	N	N	
		4. Pre-assessment	N	N	
		5. Geographic scalability	S	S	
	Product Tools	6. Big Data	S	S	
		7. Reporting	S	S	
		8. Registration	S	S	
		9. Filters	S	S	
		10. Athlete history	S	S	
		11. Data Integration	S	S	
		12. Data Privacy	S	S	
		13. Product Modularization	S	S	

In your opinion, how is the market for attracting athletes currently?	Do you see space today for clubs to use a platform that displays their information (technical data, videos, etc...)? Would you use?	As a user, what are the main tools the platform should have so that athletes can show the maximum possible potential, looking for some opportunity?	What functionality would you most value on the platform?	Do you believe that this offer would be adhered to by the target audience (athletes and young people who dream of being football players)?
Ulisses: Nowadays, the football market works on two fronts: One refers to the athlete who has great persistence and resilience, and the other to the athlete who has financial and family support to fund some opportunities. Either you have money, or you can stand the precarious conditions that Brazilian football offers. Playing for a big club depends on several factors, such as above-average technical quality. The sieve market focuses on athletes under the age of 15 years. Above this age, the athlete must have financial stability to cover their expenses abroad, in addition to being a good businessman. Renan: For the athlete to be able to show their skills in a test, they should be in an extensive evaluation, of at least one week. He must be well adapted to the environment and get into the rhythm of the club's athletes. These are aspects that evaluators currently do not take into account, which makes the process unfair.	Ulisses: I would use the platform. Depending on club levels, it could be great gateways for young athletes. Renan: Yes, I would. It would be widely used and would have great visibility.	Ulisses: Videos tools, athlete contact information. It would be interesting for the platform to be a kind of "virtual entrepreneur" to exchange the process. Putting the CBF's BID tool to link players would also be interesting. Renan: It would be interesting for the data to be updated according to changes in the characteristics of the athletes.	Ulisses: The BID tool linked to the athlete's registration Renan: That the platform has the tool that provides the update of data as athletes change.	Ulisses: Yes, it would have great adherence from young people who aspire to be football players. Today, anyone has a cell phone, so any young person is able to register. Renan: Yes, it would democratize the access of athletes, which today depends on many factors, such as business and money. The application would allow, in an objective and direct way, the best ones to be selected, making the process fair.

Source: Made by author.

Appendix F. Empathy Map.

The Empathy Map helped the author put himself in the Personas' shoes. The tool helped to reflect on what the customer thinks and feels, hears, sees, speaks, and does. With this, the analyzed people are understood in greater depth, later leading to prototyping. The image below shows the record:
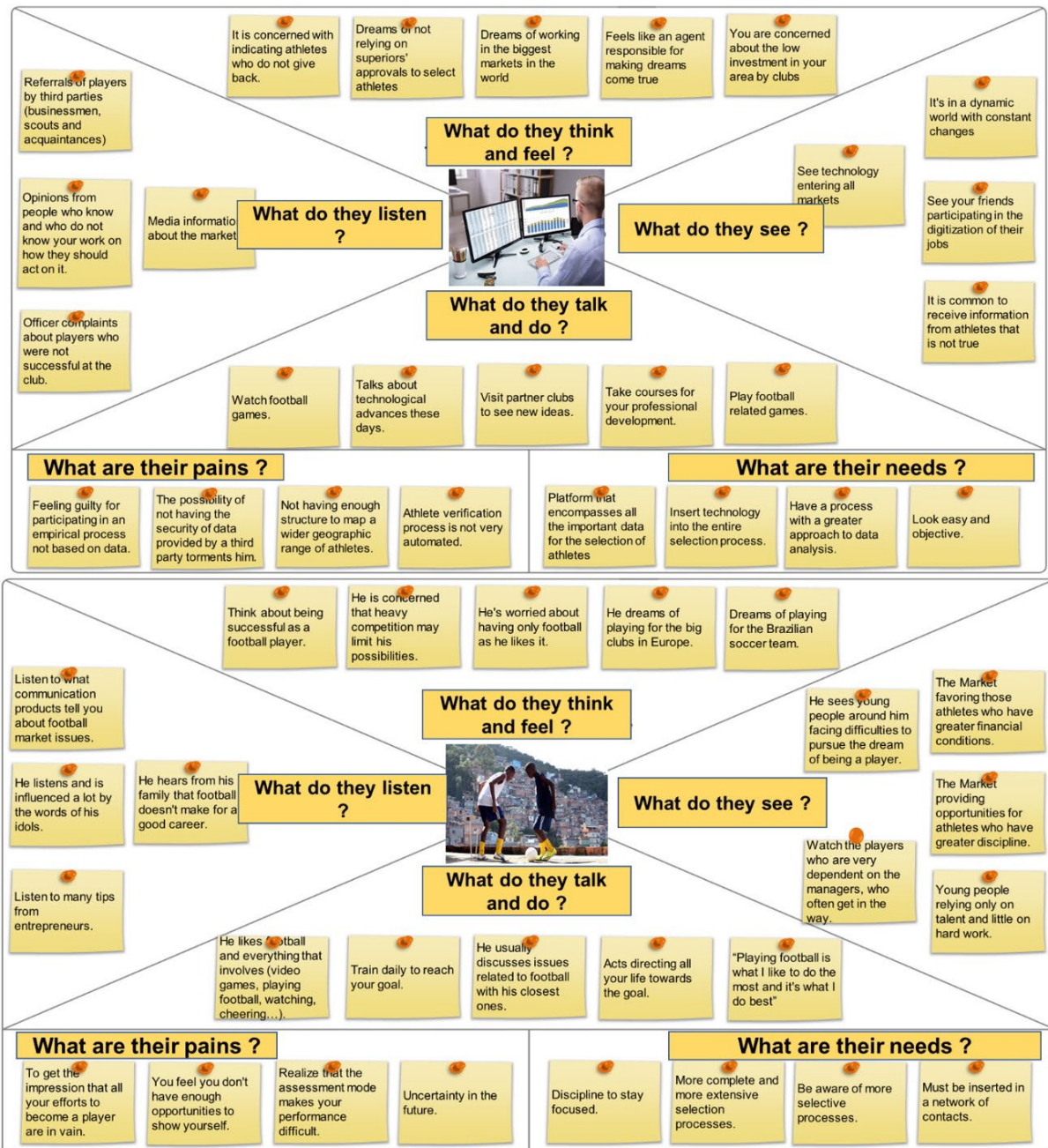
Source: Made by author.

Appendix G. Quali-quantitative market research.

The market research was built based on research carried out previously within the immersion process. Questions posed to respondents used secondary-level requirements to be developed. The image below presents the questions:

Primary Level	Affinity Diagram		Secondary level	Question	Who will answer?
Business	Process	Investment	Invest in a data platform to support the capture of athletes.	How important do you think it is to invest in this platform?	Team
				How much would you pay?	Team
		Others	The platform as an aid tool for the approval of athletes.	How much would the platform help in your approval?	Player
			Increased efficiency in the player selection process.	Do you believe that the platform can help in the player selection process?	Team
	Acess/Opportunity		Dissemination of the Platform to different locations in Brazil - to have a wider geographic range.	How important is it to promote the platform throughout the most varied regions of the country?	Team
Product	Processo	Resources	Have a data security system that blocks customer data leakage.	Have a data security system that blocks customer data leakage.	Team
			Look easy and objective.	How important do you think the platform has an easy and objective look?	Both
			Deliver a 100% database-based solution to users.	How important is the use of Big Data for application use?	Team
		Others	Consider health aspects/criteria in the process in the filters (physical conditioning, body mass index, for example).	What are the most important physical characteristics to be presented?	Team
			Interconnection with sports platforms (CBF BID, State Federations)	How important is it to have the interconnection with the databases of sports federations?	Team
			Classification according to company pre-assessment	How important is it to have a pre-assessment of the athlete carried out by the company, generating ratings?	Team
			Consider technical aspects/criteria for the analysis of athletes (position, movement, moves…)	What are the most important technical characteristics to be presented?	Team
			Registration	What are the relevant registration information to be presented by the athletes?	Both
	Acess/Opportunity		Disclosure of sieving dates, as disclosed by the clubs.	How important is it to have a sieving schedule in the application?	Player
			Iteration between players on the platform, as a kind of social network.	How important is it to have a social network for athletes' iteration?	Player

Source: Made by author.

Appendix H. Quality characteristics assessment scales

According to Ribeiro et al. (2001), the competitive assessment (Mi) analyzes each item of quality demanded about the competition (commercial benchmarking), while the strategic assessment assesses them according to their relevance to the company's business, considering the managerial goals defined for the future. For the correct prioritization of the quality characteristics to be worked on, it is important to consider the competition standards, and, through this, a technical benchmarking (Bj) is carried out, so that the company's product is compared with the competition, considering the technical aspects (Ribeiro et al, 2001). The Dj index is used to assess the difficulty of modifying the specifications of quality characteristics. To determine the importance of each quality characteristic (IQ), the relationships they maintain with the items of the demanded quality are made, as well as the relative importance of these items (Ribeiro, 2001).

The image below presents the evaluation parameters for the quality requirements carried out within the construction of the QFD Quality Matrix. With this, the author managed to align the degree of importance of each quality requirement with its due strategic importance for *designers.*

Competitive Evaluation (MI)		Strategic Assessment (Ei)	
Importance	Weight	Importance	Weight
Above the competition	0.5	Small importance	0.5
Similar to competition	1	Medium importance	1
Below the competition	1.5	Big importance	1.5
Far below the competition	2	Very great importance	2
Technical Benchmarking (Bj)		Modification difficulty (Dj)	
Above the competition	0.5	Very Hard	0.5
Similar to competition	1	Hard	1
Below the competition	1.5	Moderate	1.5
Far below the competition	2	Easy	2

Source: Made by author.