

Dashboard design for MiniSoccerBal 3.0

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The MiniSoccerBal is amongst the training accessories that has been introduced into the sports market for the soccer domain. Ongoing study is focusing on the use of video and deep learning models to obtain useful information regarding a player's contact with the ball and visualising it on a dashboard. This paper presents the design and evaluation of a dashboard that helps soccer coaches track the development and performance of players based on their interaction with the MiniSoccerBal. The Design Thinking Process (DTP) developed by Stanford University was followed throughout the research. 8 participants, consisting of 2 soccer coaches and 6 university soccer players were involved in the usability testing which was created based on the Technology Acceptance Model (TAM), evaluating on the perceived usefulness and perceived ease of use. The participants were given the choice from 1 (Extremely Unlikely) to 7 (Extremely Likely) for their responses on the Likert Scale questions and given space to provide additional feedback. Majority of the responses from the participants ranged between 6-7 for the perceived usefulness and 4-6 for the perceived ease of use. The DTP was regarded as a useful methodology as it involved the users in the design process which led to an overall acceptable prototype of the dashboard.

Additional Key Words and Phrases: SDTP, Human-Centered-Design, Soccer metrics, Soccer coach, player development, Dashboard design

1 INTRODUCTION

Soccer is one of the sports that is very popular in many regions of the world. This is further reinforced by Kirkendall [17], claiming that research in the subject of soccer is the most plentiful when compared to other sports. Many professional teams invest heavily in their facilities, staff, research and training accessories with the aim to achieve the best outcome as a club. The MiniSoccerBal is amongst the training accessories that has been introduced into the sports market.

According to their website[21], the MiniSoccerBal is a product that entails a soccer ball with a cord that can be held by/attached to the player. The purpose is to provide players with more ball contacts in a shorter amount of time which improves their technical skills. This product is currently being utilized by professional teams such as FC Twente, FC Utrecht and PEC Zwolle to train their youth teams. Ongoing research is focusing on the use of video and deep learning models to obtain useful information regarding a player's contact with the ball. This research aims to replace the current MiniSoccerBal to a new version that solely uses video to measure specific data without any sensors on the ball or player. The new MiniSoccerBal will also entail a dashboard to visualise data obtained from the video to inform interested users.

Utilising dashboards can play a crucial role when it comes to data

analysis as it aids in visualising the data for the user. Dashboards can provide relevant parties with valuable insights[4], which explains why professional teams put a focus on performance analysis[10]. In this context, the coaching staff of professional teams can track the development of their players in a more detailed manner which can be very useful.

The design of dashboards is one of the most significant factors to consider. A strong design will enable the transmission of critical information as well as supporting evidence that users will find valuable [4]. Since humans can assimilate massive amounts of data when presented in meaningful ways, this makes it even more critical[23]. There are many factors that influence the design of dashboards such as the specific target audience, the lenses in which the users interpret the dashboard, the right metrics and the right visualisations[1].

2 RESEARCH QUESTIONS

This research contributes answers to the following questions:

- **RQ1:** What player metrics are coaches interested in with regards to the MiniSoccerBal and how they can affect player development in the future?
- **RQ2:** How does the requirements of soccer coaches drive the design of the dashboard?
- **RQ3:** How does the dashboard perform in regards to perceived usefulness and perceived ease of use in accordance to the Technology Acceptance Model (TAM)?

3 RELATED WORKS

This section introduces the findings from an initial literature review on the respective topics.

3.1 Design Thinking

Design thinking is an iterative process that involves gaining a better understanding of the users and developing creative solutions that can be prototyped and tested [9]. This methodology has been thriving in multiple domains such as IT, healthcare and education due to its effectiveness [7]. Multiple models that affiliate with design thinking have been proposed by design schools from universities such as Aalto University, Singapore Polytechnic and also organizations such as IDEO [15].

However, the Design Thinking Process (DTP) paradigm developed by Stanford University is one of the most popular models as design teams have successfully created innovative products and concepts using this [22]. The processes of the DTP can be found in Figure 5 of Appendix B.

3.2 Dashboard Design

Following exploratory research into dashboard design, the work of Janes, Sillitti, and Succi [16] proposed two possible usages when

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it comes to using a dashboard, a push and a pull. A push dashboard being one where the user is mainly presented data without having much interaction with the dashboard while a pull allows users to go in depth for what they are interested in. As every dashboard is unique, a dashboard designed for a specific target group can be deemed incomprehensible by users of other target groups [4].

The effectiveness of a dashboard is measured based on how it acts as a communication medium rather than the quality of the visuals. The main reason as to why dashboards fail to communicate information effectively to its users is because they are not implemented based on how users in the target group perceive and see things[12], stressing on the importance of understanding the users. Many Learning Analytic (LA) scholars have been involving users in the design aspect of dashboard implementations to ensure an alignment towards the same goals of the dashboard which prevent users from making the wrong conclusions from the presented data [1].

3.3 Data

Data also has a crucial role in the implementation of dashboards as they are what the users interact with. An issue that is ever-present in most dashboards is what data to present. An effective dashboard consist of the right data for the user whilst having irrelevant data could be counter-productive as it provides no value to the users[16]. The measurement model derived by Janes, Sillitti and Succi [16] establishes a precise way in choosing which data to present by ensuring that the goal of each data representation is inline with the overall goal of the dashboard. Following this model, populating the dashboard with irrelevant information can be avoided as much as possible.

3.4 Data Visualization

Visualizations play an important role in communicating information to the user. When done properly, they can even make complex data easily comprehensible for the users [27]. A few examples include charts, graphs, diagrams and videos. Users will be able to easily identify certain trends or find explanations as to what they observe with the help of visual aids [4]. A dashboard's usability can be improved by ensuring that visualisations taking the least amount of time to comprehend are prioritised [16].

Research in the field of competitive sports data visualisation has been advancing as it has become crucial for professional analysis. With the help of analysis, professional teams are able to make effective decisions which can affect the team's training and performance[10]. However, the quantity of data in competitive sports is generally large which is why visualisation in this context is challenging. Without proper visualisation of data, many trends and information will be hidden to the naked eye[10]. The work of Shen-Hsieh and Schindler [24] provided an example of how effective data visualisation can help companies to make strategic decisions.

3.5 Usability Testing

The Technology Acceptance Model (TAM) is one of the most influential and used methods to obtain the feedback of an individual

with regards to a computer system [19]. TAM was created based off the Theory of Reasoned Action (TRA) model proposed by Ajzen and Fishbein [2] and evaluated the system from a user's perspective in two aspects, perceived usefulness and perceived ease of use. According to research conducted by Igbaria et al. [14], TAM was found to not only be an easier and simpler model to use but also managed to outperform TRA in terms of obtaining user acceptance to a computer system.

The System Usability Scale (SUS) derived by Brooke[5] is yet another usability testing method. It has been used mostly as a quick and efficient method to gauge a system's acceptance by the users. However, the general consensus is that the questions within the SUS are not precise enough in regards to the terms used and that 12-14 participants were required to get a reasonably reliable SUS score[6, 26], which might be a challenge for this research.

4 METHODS

This section introduces the methodology followed throughout the research process.

4.1 Literature Review

Further literature review had to be conducted to obtain deeper knowledge in the field of Human Computer Interaction. Specifically, Chapter 8 of the "Research Methods in Human Computer Interaction" guide written by Lazar, Feng and Hochheiser[18] was consulted to understand how to conduct and analyse effective interviews.

4.2 Initial Interview

After the literature review, an interview was scheduled to be conducted with an expert in the field of soccer to get a more personal and detailed insight on the domain. This process was part of the "Empathize" phase of the DTP with the purpose of grasping requirements by engaging with the intended users. The questions were separated into 8 different categories to get a better scope of the interview.

- (1) Credibility
- (2) Role of the MiniSoccerBal in training sessions
- (3) Dashboard Design
- (4) Functionality
- (5) Future Development/ Training
- (6) Graph Analysis
- (7) Player Analysis
- (8) Player Metrics

Credibility questions were meant to get an insight on the participant's experience and background in the soccer domain. Questions categorised under "Role of the MiniSoccerBal in training sessions" helped predict the effects of the data shown on the dashboard for future player development. The questions under the 3rd to the 7th category were meant to grasp the expectations of soccer coaches on the dashboard and to understand current methodologies involved with player analysis respectively. Questions related to player metrics were used to obtain metrics which were of interest to soccer coaches regarding the MiniSoccerBal.

Prior to the actual interview, a mock interview was conducted with a relevant stakeholder with experience playing soccer for several years. The aim of the interview was to receive feedback on the questions by observing reactions and answers. Improvements were made which helped maximise the quality of insights obtained from the actual interview. The final list of interview questions can be found in Appendix A.1.

The actual interview was conducted on the 13th of May with a core coaching staff member of the Twente Football School. The interview was conducted in a semi-structured manner to allow for flexibility to follow up on responses. Interview coding was done by analysing the transcript, specifically identifying the frequency of certain terms and relationships between the terms used. The “Define” phase of the DTP is where research questions are modified or formed as necessary in which none were modified in this research.

4.3 Initial Interview Findings

As the questions asked during the initial interview were already categorised, answers were grouped based on their relevance to the respective categories. However, during the coding process, a new category, **Data Visualisation** was formed as a result of a discussion regarding the issues of having irrelevant information presented on dashboards.

The first theme identified was “**Grounding for research**” which included codes pertaining to credibility and role of the MiniSoccerBal in training sessions. This was used as a foundation for the research, understanding how the MiniSoccerBal is integrated into the training sessions. The second theme constructed was “**Dashboard Requirements**” which contained codes regarding dashboard design, functionality, data visualisation and graph analysis which helped recognize the desires of the dashboard from a soccer coach’s perspective.

The last theme identified was “**Player metrics, future development of players and planning of future training sessions**” which contained codes related to player metrics, future planning/development of players, player analysis and the role of the MiniSoccerBal in training sessions. This identified the potential impact of the metrics visualised on the dashboard on the future development of players and planning of future training sessions based on the role of the MiniSoccerBal.

4.4 Lo-Fi Prototype

A Lo-Fi prototype of the dashboard was designed as part of the “Ideate” phase to envision an initial design of the dashboard. The layout and content of the dashboard were the main focus of the Lo-Fi and was designed according to the responses obtained from the initial interview. The Lo-Fi prototype can be found in Figure 1.

The dashboard will be made up of 4 components with **Component 1** showing the total number of ball contact by players sorted by date. **Component 2** will provide an overview on the distribution of left

and right ball contact of individual players over time. **Component 3** of the dashboard will present coaches with information regarding the kick pattern of a player’s interaction with the MiniSoccerBal on a specific date. It will comprise 2 parts, one visualising the graph and one showing the recording of the training. **Component 4** will show an overview of the average contact speed and rotation of the ball.

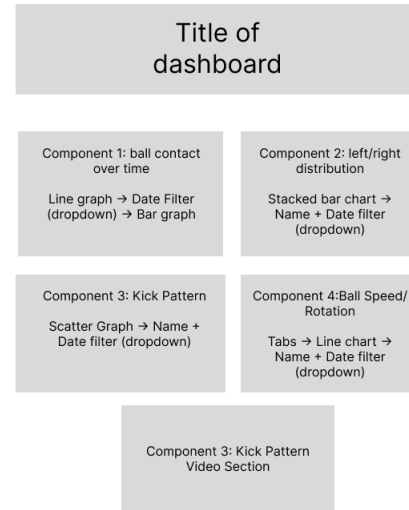


Fig. 1. Lo-Fi prototype

4.5 Hi-Fi Prototype

A working proof of concept was implemented using Python as the main programming language along with libraries such as Plotly for the generation of graphs and Pandas for the handling of data. The Dash framework was used to update the dashboard based on user’s interaction due to its simplicity. The components of the dashboard mentioned in Section 4.4 were made up of cards from the Dash Bootstrap Component library. The Hi-Fi prototype can be found in Figure 2.

4.5.1 Component 1.

As the aim of this component is to show progression of the total number of ball contacts by all players over time, the work of Bakusevych [3] recommends a line graph as the most suitable option as it concerns a relationship over time. The average line allows coaches to benchmark the performance of players on a specific date. The drop down allows coaches to filter based on a specific date to get an overview on the players who trained on the respective date and the number of ball contacts individually, in which a bar graph is used to ease static comparison[3].

4.5.2 Component 2.

With the component showing the distribution of left/right ball contacts of a player over several dates, a stacked bar chart is used instead of a line graph as each date will have 2 variables (left and right contacts) which eases the visualisation. The selection of players and

their corresponding dates of training to be visualised on the graph can be customised with the dropdown, allowing coaches to filter based on their interest.

4.5.3 Component 3.

Component 3 shows the kick pattern of a player's interaction with the MiniSoccerBal, comprising of 2 cards, one for graph visualisation and one for a video section. To illustrate an example for the graph, if the player first kicked the ball with his right foot (R), followed by the left (L) and right again, the data registered would be R,L,R. The data points will be registered as dots with the kick number on the x-axis and the two variables (L and R) on the y-axis. The dropdown can be used to customise the player and corresponding training date. The graph also provides information on whether the player had a correct contact with the ball and is registered as a green marker or red otherwise. The concept of a correct/incorrect kick is an abstract one but it can be defined by the coaches and implemented such that it can be detected by the deep learning model.

The video section provides coaches an opportunity to rewatch a player's training with the MiniSoccerBal. They can choose to watch the entire recording or to watch from a corresponding ball contact. The latter can be done by clicking on the respective data point from the kick pattern graph in which the video will reindex to the corresponding timestamp. This is a useful feature when coaches specifically want to analyse the player's incorrect contact with the ball.

4.5.4 Component 4.

As this component concerns metrics regarding ball contact speed and rotation, tabs were used to visualise data within one card with the default showing the average ball contact speed. The coaches can easily navigate through tabs by clicking on the respective tags located at the top of the card. All graphs in this component are drawn with a line graph as it shows the progression over time. The dropdowns can be used to select a player and their respective training dates to be visualised on the graph.

4.6 Usability Testing

Usability testing was carried out to verify the prototype. As the coaches contacted were busy during the testing period, responses were difficult to obtain hence, having to also rely on the next relevant stakeholders which were soccer players. The testing was conducted with a total of 8 participants, consisting of 2 soccer coaches and 6 university soccer players.

The soccer players were sensitised as to what the MiniSoccerBal is and how it is involved in training sessions in order for them to put themselves in the mindset of a potential user of the dashboard. The procedure for all participants were as follows:

1. Watch recording of dashboard interaction
2. Interact with dashboard
3. Answer questionnaire

The recording was meant to teach the participants how to use the dashboard. The questionnaire was created based on TAM and was separated into 2 parts, perceived usefulness and perceived ease

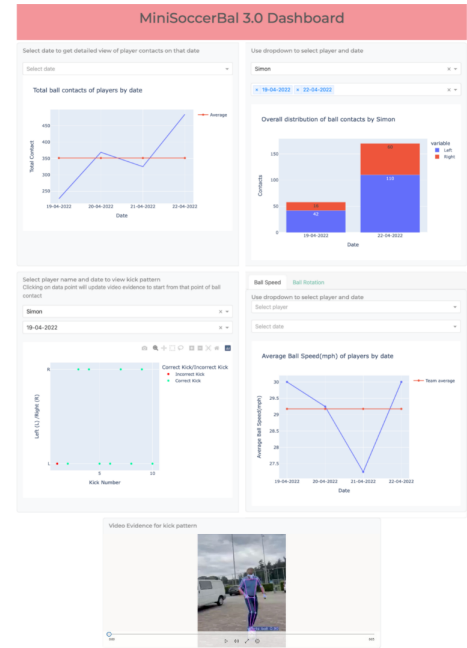


Fig. 2. Hi-Fi prototype of dashboard

of use. Both consisted of Likert Scaled questions ranging from 1 “Extremely Unlikely” to 7 “Extremely Likely” and also open ended questions to provide feedback. As the questionnaire was created manually, the internal consistency of the questionnaire had to be calculated to ensure that all questions were measuring the same concept[25]. The internal consistency can be obtained by calculating Cronbach’s alpha[8]. The full list of questions for the prototype evaluation can be found in Appendix A.2.

5 RESULTS

5.1 Usability Testing

Cronbach’s alpha value for the questions regarding the perceived usefulness was calculated to be 0.87 and 0.94 for the perceived ease of use. These are good acceptable values for internal consistency within the questionnaire, compared to the minimum 0.7 proposed by George and Mallery[13].

5.1.1 Perceived Usefulness.

The overview of the responses received from the participants regarding the perceived usefulness can be found in Table 1, Table 2 and Figure 3.

Table 1. Responses from participants regarding perceived usefulness

	Q1.1	Q1.2	Q1.3	Q2.1	Q2.2	Q2.3	Q3.1	Q3.2	Q3.3	Q3.4	Q4.1	Q4.2	Q4.3
P1	6	5	7	6	7	7	5	6	6	7	5	7	7
P2	6	6	7	6	7	6	7	6	7	7	6	6	6
P3	7	7	7	7	7	7	7	7	7	7	7	7	7
P4	6	6	7	6	6	6	6	6	6	7	6	6	7
P5	3	6	7	5	7	7	7	7	7	7	5	6	3
P6	5	5	6	6	7	6	5	6	5	4	6	5	5
P7	7	7	7	6	7	7	7	7	7	7	7	7	7
P8	6	6	7	4	7	6	4	6	4	4	7	3	3

Table 2. Statistics of responses from participants regarding perceived usefulness

Minimum	3
First Quartile	6
Median	6
Third Quartile	7
Maximum	7
Mean	6.16

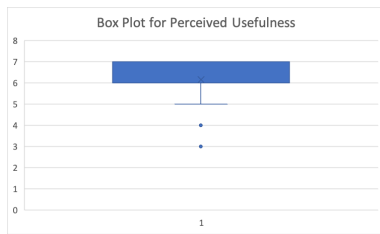


Fig. 3. Evaluation by participants on perceived usefulness

Additional feedback obtained during usability testing :

Coach 1: "Gamification could be nice to challenge players to achieve specific targets, would also be nice to be able to compare data of multiple players"

Coach 2: "Number of times hitting the ball is important, left/right distribution and speed are nice to have, would be nice if an app could be made for this"

Player 5: "Dashed line for average could be better, combined graph for both speed and rotation of the ball could be a better visualisation"

5.1.2 Perceived Ease of Use.

The overview of the responses received from the participants regarding the perceived ease of use can be found in Table 3, Table 4 and Figure 4.

Table 3. Responses from participants regarding perceived ease of use

	Q1	Q2	Q3	Q4	Q5
P1	6	7	7	6	5
P2	4	3	4	3	4
P3	6	6	6	6	5
P4	7	6	7	7	6
P5	3	4	3	2	4
P6	5	5	6	4	7
P7	4	4	4	4	4
P8	5	6	5	5	4

Table 4. Statistics of responses from participants regarding perceived ease of use

Minimum	2
First Quartile	4
Median	5
Third Quartile	6
Maximum	7
Mean	4.98

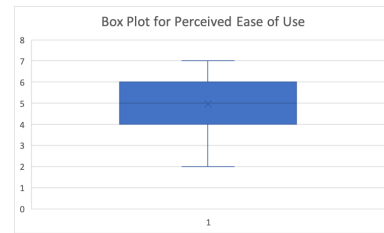


Fig. 4. Evaluation by participants on perceived ease of use

6 DISCUSSION

This section discusses the research questions that were of focus within this paper.

RQ1: What player metrics are coaches interested in with regards to the MiniSoccerBal and how they can affect player development in the future?

These were the metrics ranked based on importance obtained during the initial interview.

1. Total number of ball contact of all players by date
2. Dates of players training
3. Distribution of ball contact with their left and right foot
4. Kick pattern of a player on a specific date
5. Average contact speed and rotation of the ball

Metric 1 provides coaches with a benchmark of the team's overall performance during training. With this, coaches can set certain targets to be achieved when planning for future training sessions. Metric 2 can help coaches gauge the determination level of players as it provides an estimate on the frequency that the players train

with the ball. As take home assignments to learn specific tricks with the MiniSoccerBal are sometimes given to the players, this metric can provide an insight to the coaching staff on the discipline of the players as they are able to tell if they have been putting in effort to work on the assignment outside training sessions.

Metrics 3 and 4 goes inline with the intended goals of the MiniSoccerBal which is to improve a player's technical ability. Metric 5 is of no surprise as they are already being measured using existing smart balls in the market such as the Adidas SmartBall[11]. As the MiniSoccerBal is used as a technique training, knowing these metrics will enable the coaches to track the development of a player's technique and to observe if the drills are being performed properly.

In regards to player development, coaches will be able to potentially identify struggling/excelling players by being able to measure the technical ability of players. From the initial interview, it can be concluded that soccer coaches can use the metrics to provide focused training to improve on a player's weakness to further develop their skills. The interviewee also stated that the potential conversations that can be brought up using the data from the dashboard can be very meaningful such as having discussions with players regarding their development/performance. The interviewee added that these conversations can help deepen the relationship between the coach and the players which can lead to a healthy training environment, potentially improving a player's overall performance.

RQ2: How does the requirements of soccer coaches drive the design of the dashboard?

Throughout the interview, the interviewee strongly stated the fact that as soccer coaches, they are interested in being able to filter and analyse data in a more detailed manner. Regarding the push/pull dashboard referenced in Section 3, a pull dashboard is more suitable for soccer coaches as it accommodates for their intentionality to further inspect on interested data. As the MiniSoccerBal is mainly used within youth training for kids, a push dashboard is more suitable if the players are to be included as users of the dashboard. As the attention span of kids could be as low as a few seconds [20], there can be many benefits of being able to efficiently convey information without much interaction with the dashboard. As the dashboard is mainly designed for soccer coaches at this stage, a pull dashboard was prioritised over a push one.

As coaches and players are constantly travelling around for training sessions or tournaments, it is important that they are able to view the dashboard on the go. In situations like those where time is not in abundance, being able to view information efficiently and quickly is important. Hence, the dashboard should be designed such that it accommodates for mobile/tablet view. Due to time constraints, ensuring that the visualisations are correctly displayed on a laptop was of top priority.

The layout of the dashboard was designed in such a way that the order of the content matches the priorities of the coaches. The priorities of the coaches were obtained by referencing the answers to

RQ1. Specifically, Component 1 accommodates for Metrics 1 and 2, Component 2 accommodates for Metric 3, Component 3 accommodates for Metric 4 and Component 4 accommodates for Metric 5.

Regarding the graphs, it was understood from the interview that the wording of the axes and title is important as they are what is to be first looked at upon looking at a dashboard. Extra care was given to the terminologies used to ensure consistency between the graphs. This helped ensure that the graphs are readable at first glance and to prevent any misunderstandings that could lead to wrong conclusions.

RQ3: How does the dashboard perform in regards to perceived usefulness and perceived ease of use in accordance to the Technology Acceptance Model (TAM)?

Referencing Figure 3 in Section 5.1, it can be seen that majority of the responses from the participants were in the range of 6-7 for the questions on the perceived usefulness of the dashboard. Additionally, having a median of 6 and mean of 6.16 also contributed to an overall positive feedback from participants on the usefulness of the dashboard. Although the majority of the responses were positive, the box-plot identified two which stated otherwise, specifically the values 3 and 4.

Some things were identified from the feedback received that could benefit from further investigation. The first response included a new functionality to compare data between players. The dashboard currently provides functionality to delve into a single player's data but having the functionality to compare between players can increase the usefulness to the coaches which makes it worth pursuing in the future. The second response verified the importance of the metrics visualised in Component 1 while the rest were considered as nice to have. This means that soccer coaches could have different perspectives regarding the metrics that they would like to have displayed on the dashboard. The third response provided feedback specifically for Component 4, indicating room for improvement for the graph visualisation.

With regards to the perceived ease of use, Figure 4 in Section 5.1 provides a box-plot figure that shows the majority of the responses were between the range of 4-6. The median value of 5 and the mean of 4.98 also contributed to a rather neutral feedback from the participants regarding the perceived ease of use.

7 CONCLUSION

This paper contributed to the first working proof of concept of an effective dashboard for the ongoing MiniSoccerBal 3.0 project. The dashboard received positive feedback from soccer coaches and soccer players during the prototype testing, particularly receiving responses between the range of 6-7 for the perceived usefulness and a range of 4-6 for the perceived ease of use. Additionally, there was no discernible difference in the participants' opinions of the dashboard's usefulness and usability between those who participated in its design and those who did not, suggesting that even those without

prior knowledge of the dashboard shared this opinion. This shows that the DTP is an effective methodology to follow as it involved the intended users in the design process which led to the acceptance of the prototype.

8 FUTURE WORK

The usability testing can be taken further by involving more soccer coaches in the process. Although the players are potential stakeholders for the dashboard in the future, the soccer coaches are still the primary users of the dashboard and therefore could provide better insights at this stage. As the prototype was mainly a pull dashboard for the coaches, a push dashboard can be implemented in the future to allow for the players to utilize the dashboard as well. Particularly, some sort of gamification embedded within the dashboard can be used to attract the players to utilize the dashboard. An example obtained during the initial interview would be to present the metrics in a way that is similar to those shown in FIFA games, which is a widely popular soccer video game franchise created by EA SPORTS.

Component 4 could also use some improvements in terms of the visualizations. Research could be done to investigate the usefulness and effectiveness of merging two separate graphs into one. With this, the tabs can be removed which can make the dashboard more usable and readable for the users.

Considering the short timeline of the research, considerations had to be taken to ensure that the project could be completed on time while following the necessary procedures. For example, only one coach was interviewed for the initial interview as the conduction, transcription and analysis of the interview taking a significant amount of time. The feedback from RQ3 proves that having more participants could help gain multiple perspectives on how to design the dashboard or to obtain validation between the ones given which will make the dashboard more effective. The dashboard can also be further improved by making the components adaptable to the screen size to accommodate for mobile/tablet view.

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A INTERVIEW

This section provides all necessary information regarding the interviews that were conducted for the research.

A.1 Initial Interview

Credibility:

Asking interviewee for an introduction

Role of the MiniSoccerBal in training sessions:

1. Do you use the MiniSoccerBal in every training session?
2. Do you use the MiniSoccerBal as a warm up exercise, drill, or exercise in your training sessions?
3. How much time do you make players train with the MiniSoccerBal during training sessions?

Dashboard Design:

1. What is your general experience with using dashboards?
2. How do you envision yourself using this dashboard?

Functionality:

1. What are your thoughts on being able to filter for specific information within a graph?
2. Would being able to see the dashboard through other devices besides a laptop be an important aspect? (if yes:Q3, else:Q4)
3. Can you give examples of those devices?
4. What are your opinions on using different colours to highlight important information?
5. (Explain push/pull concept) Which is more important to you?

Future Development/ Training:

1. How would these metrics help with a player's development?
2. How would knowing these metrics affect how you plan your training sessions?
3. What would you do when the dashboard presents you information about a player that is performing lower than the team average?
4. What would you do when the dashboard presents you information about a player that is performing higher than the team average?

Graph Analysis:

1. How often do you make use of graphs on a daily basis?
2. What do you focus on first when you are being shown a graph?
3. What is the easiest and hardest thing when it comes to reading graphs?

Player Analysis:

1. Do you perform any player performance analysis after training sessions? (if yes:Q2, else:Q5)
2. How often is player analysis being carried out?
3. What sort of methods are you currently using to analyze a player's performance?
4. Who are the people who will get to see the analysis done on a player (elaborate further if needed)
5. Do you have a small discussion with the rest of the coaches after training sessions regarding player performance during training?

Player Metrics (If Q1 of player analysis is yes:Q1, else:Q2):

1. What kind of player performance data do you currently analyse?
2. What are some of the metrics would you be interested in with regards to player's interaction with the MiniSoccerBal?
3. What are the most important metrics you want to see and how would you rank them accordingly?

A.2 Prototype Evaluation Interview

Perceived Usefulness:

1. Component 1
 - 1.1. The graph is useful as it tells me how my players are performing over time
 - 1.2. The average line tells me if my players performed well on a specific date compared to other dates
 - 1.3. The date filtering option is useful as it shows me who trained with the MiniSoccerBal on that date and how many contacts they

had individually

2. Component 2

- 2.1. The graph is useful as it shows me the overall distribution of ball contact of a player based on the dates they trained
- 2.2. The graph is useful as it shows me the ratio of left and right contact of players with the MiniSoccerBal to see if they are training with both legs
- 2.3. The filtering option is useful as it allows me view the data of the player I am interested in

3. Component 3

- 3.1. The graph is useful as it shows the kick pattern of the player on a specific date to see how the player trained with the MiniSoccerBal
- 3.2. The graph is useful as it shows me if the players are having the correct or incorrect contact with the ball
- 3.3. The video section is useful as it allows me to play the recording of the player training with the ball on that date
- 3.4. Being able to watch the recording for a specific ball contact instead of the entire video upon clicking on the data point on the kick pattern graph is useful as it will save time

4. Component 4

- 4.1. The graphs are useful as I can see how fast the players are kicking the balls and if they are kicked with alot of spin
- 4.2. The filtering options are useful as it allows me to go in depth regarding a player's contact with the ball
- 4.3. The average lines are useful as it allows me to compare how the players performed on a specific date compared to previous dates

Perceived Ease of Use:

1. I found it easy to get the dashboard to do what I wanted it to do
2. I found the layout of the dashboard to be neat
3. I found the filtering options easy to use and understand
4. I found the graphs easy to understand (title of the graph, x and y axis, etc)
5. It would be easy for me to become skilful at using the dashboard

B FIGURES

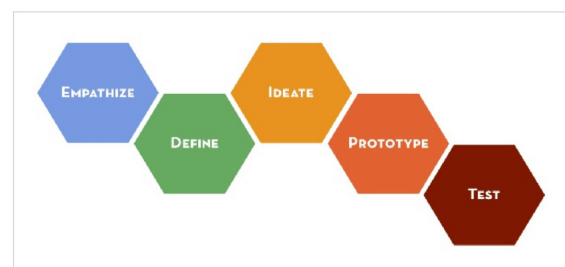


Fig. 5. Design Thinking Process Model by Hasso-Plattner Institute of Design at Stanford University