

IST659- FALL23
Data Admin Concepts and Database Management

TEAM - Byte Benders

Introduction

In the world of football, accurate and comprehensive player data is the foundation of effective team management, scouting, and statistical analysis. In this project, we will harness the power of a Database Management System (DBMS) that can revolutionize how football is managed, tracked, and enjoyed at all levels. This will not only assist clubs, coaches, and players but also engage fans, analysts, and administrators. It will be a dynamic platform designed to handle the vast amount of data associated with football. This database aims to serve as a centralized repository for storing, managing, and querying data related to football players, encompassing various aspects of their performance, including skills, passing, scoring, and goalkeeping.

This project will provide valuable insights for teams, enable fans to stay connected with their favorite clubs and facilitate seamless tournament management for administrators.

Literature Review

In paper [\[1\]](#), on “Identifying Football Players playing Styles: A Systematic Review” is about identifying playing styles in football is highly valuable for achieving effective performance analysis. While there is extensive research on team styles, studies on individual player styles are still in their early stages. Thus, the aim of this systematic review was to provide a comprehensive overview of the existing literature on player styles and identify research areas required for further development, offering new directions for future research. Performance analysis in football is not only a crucial tool for coaches but also a subject of extensive research in recent years. However, the performance of soccer players is multifactorial in nature, influenced by factors such as technique, fitness, individual tactics, psychology, personality, and physical characteristics in combination with contextual variables like match status and location. Therefore, by considering all these factors, the individual profile style of each football player can be determined. As a result, soccer players can adopt different styles even when playing in the same position, highlighting those traditional positional labels (goalkeeper, defender, midfielder, forward) are no longer sufficient.

A definition of players' playing styles has been given by Decroos and Davis. According to them, a player's playing style can be described by examining their preferred position on the field and the types of actions and movements they tend to execute during a game. Understanding the playing style of soccer players can provide coaches with valuable insights in many areas: (1) Player scouting Teams require players whose style aligns with the team's play style and the other players. Otherwise, they may invest a significant amount of money in a player who, despite their individual talent, cannot effectively contribute to the

team. (2) Player development Knowledge of a player's playing style can be utilised to assist them in improving their skills and game. By identifying areas where a player may need improvement, coaches can tailor training and development programs to address weaknesses and enhance the player's strengths. (3) Team selection and tactics Coaches can utilise knowledge of a player's playing style to select the most suitable players for a particular match although team playing styles have recently been reviewed in the literature], no comprehensive review of existing research on individual soccer players' playing styles has been conducted to date.

Furthermore, given that the specific topic has only recently gained significant research attention, it is important to highlight the gaps that exist in the literature, both theoretically and methodologically. Therefore, considering the practical value of recognizing players' styles (as discussed in the previous paragraph), the aim of this study is to systematically review the existing studies on this specific subject in order to: (a) provide a comprehensive overview of the current knowledge to assist coaches and team performance analysts, and (b) assess the existing literature, identify its gaps, and propose new directions for future research.

The research showcased in this paper [2] on "Player Tracking Data Analytics as a Tool for Physical Performance Management in Football: A Case Study from Chelsea Football Club Academy" demonstrates how the data can be employed to comprehend the physical activity requirements imposed on players during both training sessions and competitive matches. Professional football clubs and players rely on GPS-based player movement tracking data to understand physical demands during training and matches. However, using this data to shape training programs remains a research gap. This study aims to bridge this gap by analysing player tracking data to uncover activity level disparities between training and match sessions, particularly among different playing positions. The research employs historical GPS tracking data to profile high-speed running activity and distance covered in both training and competitive matches. Notably, while competitive matches show significant positional differences in physical demands, training sessions do not exhibit such variations. Centre Forwards demonstrate the highest demand for High-Speed Runs (HSRs) in matches, while Central Midfielders cover more distance, on average. Additionally, the study reveals an increasing demand for high-speed work in both matches and training over four seasons. This longitudinal study contributes valuable insights from elite football settings, shedding light on the relationship between player activity levels in training and matches, and how this varies by playing position. Nevertheless, when considering the cumulative data from training sessions, there is no noteworthy distinction in the requirement for High-Speed Runs (HSRs) across various positions. Similarly, the distance covered during HSRs in training sessions displays minimal or negligible positional discrepancies, whereas such differences do exist in matches.

This research paper [3] on "Designing database for a football league: A case study of Thai football league" primarily concentrates on the data collection methods and the database design for the Thai football league. The objective is to ensure data integrity and consistency by employing normalization techniques in the database design. The paper specifically employs a cup competition as a case study for comprehensive analysis. In the context of this paper, a cup competition serves as a field that provides insights into the overall performance of each football club in each season. It's noteworthy that the number of matches competitions for each club varies based on their previous season's performance. Furthermore, the data collected for this study is categorized into two distinct groups: data from the football field

and data from external sources unrelated to the football field. The segregation of these data sources is crucial for effective analysis. Once all the data has been appropriately categorized, it can be grouped into main categories, facilitating the grouping of related or mergeable data.

In addition to the league-specific data, this research also emphasizes the importance of storing youth player information in the database. This information is vital for profiling players when they are considered for contracts with football clubs. It ensures that clubs can evaluate players thoroughly before signing them and have access to their historical performance data. Another significant aspect covered in this paper is the significance of coach profiles. It highlights the need to showcase the abilities of each coach when they are being considered for hiring by football clubs. To facilitate this, the paper suggests maintaining a comprehensive coach profile database. This database enables club managers to review and assess the qualifications and track records of potential coaches before making hiring decisions.

In summary, this research paper addresses various aspects of data collection, database design, and the importance of youth player information and coach profiles in the context of the Thai football league. It aims to provide a comprehensive framework for managing and utilizing data to enhance the league's operations and decision-making processes.

Proposed Application:

The proposed application is intended to collect and manage data from a football game scoring interface in an effective manner, storing it in a reliable database management system (DBMS). The acquired data can then be processed and shown in a variety of ways, such as tables, visualizations, and heatmaps, via a user-friendly online application.

Our team will develop a scoring interface that includes different score points relating to a football game. Real-time data will be effortlessly recorded into the database as the game continues and is scored. This phase of data collecting will be actively supported by a specialized team of data scorers, who will ensure accuracy and timeliness.

Analysts and key stakeholders within the organization will have access to the data stored in the DBMS. The final product, however, will cater to five separate user interfaces, each geared to fulfil the individual needs of various stakeholders: analysts, coaches, players, broadcasters, and fans. This customization ensures that users have easy access to the data that is most relevant to their roles. Analysts and coaches, for example, may desire detailed statistics for performance analysis, but fans and broadcasters prioritize engagement and viewership data. While we will initially develop this solution with a smaller dataset due to the project's scope, the goal is to provide a comprehensive end-to-end application that satisfies all football scouting requirements. This scalable and customizable solution will deliver priceless insights and data.

Expected Results:

The project's ultimate deliverable will comprise three critical components: a launch and scoring page, a robust database management system, and interactive user dashboards. The initial page will encompass all the essential elements required for match scoring. These elements encompass field coordinates, a time bar, a player's list, and buttons for various actions such as pass, goal, heading, and more. All data entries made on this page will be simultaneously transmitted to the database in the form of tables. Furthermore, additional data domains will be integrated into the database by utilizing the primary variables that have been provided. Subsequently, user-interactive dashboards will be generated by extracting data from the database. These dashboards will be tailored to meet the specific requirements and use cases of the stakeholders. Each user interface will retrieve data based on the necessary constraints. For instance, analysts will have maximum access privileges, enabling them to directly query the database using various retrieval commands. In contrast, broadcasters will be provided with easily readable and comprehensible information that can be shared with the public.

Conclusion:

It provides a comprehensive roadmap for database design, data collection, storage, and retrieval, ensuring that the resulting database becomes a valuable resource for the football community. This document has covered the database's architecture, data schema, and functionalities, providing guidance on creating and maintaining an efficient football player database.

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