**FIBA Player Statistics Mock-up Application: Engineering Method**

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Basketball is a worldwide known game, and it has a rich history of player, rules, and events. And even though the essence of the game itself has remained untouched, several rules and traditions have been added, modified, or removed from the game altogether. This evolutionary trend of the game has made necessary a broader reach in the data it produces, including more and more details into them, which is why a close follow-up of this data is a real necessity by institutions and organisms that regulate and promote the sport. Under this premise, we have been tasked with the development of a desktop app that is able to showcase the storage, management, and retrieval of this data, by the International Basketball Federation Association, or FIBA for short. Next up, an engineering approach to solve the problem using the Engineering Method.

## Context of the Problem

FIBA requires a desktop application that can handle worldwide basketball players’ statistics, including management, retrieval, and adding of said statistics and players. The search and storage of data must be fast and efficient.

## Development of the Solution

Based on the description of the engineering method given in the book Introduction to Engineering by Paul Wright, the following flowchart was drawn, and will be followed according to the steps shown in it during the development of the solution.



Figure 1. Flowchart representing The Engineering Method proposed by Paul Wright.

The steps shown in figure 1 are elaborated in detail following up.

## Identifying the Problem

*Identifying symptoms and necessities*

* The app should be able to show each player’s most relevant information
* The app should be able to quickly fetch and store data from search queries
* The app should be able to store large amount of data in one action effectively timewise and memory-wise
* The app should be GUI based, but should also be able to take file input such as CSV files

*Definition of the Problem*

FIBA requires a desktop GUI based application to effectively store large amount of basketball player related statistics data, and allow its management, sorting, and searching; being able to take GUI and file input of large quantities.

## Information Gathering

Given the technological context of the solutions to be proposed, the following terms must be defined prior to anything:

*Software*: Software is every application program and operative system that allow the computer can run smart tasks, directing the physical components or hardware with instructions and data through several different kinds of programs.

*Simulation Software*: A simulation software has the objective of facilitating or automating the modelling process for a real-world phenomenon, using mathematical formulas through programming. At its core, it is a program that allows the user to see what will happen after doing a specific action or set of actions, without having to do it in the real world.

*Graphical User Interface (GUI)*: A graphical user interface (GUI by its English acronym) is a program or environment that manages the interaction with the user basing itself on visual relations such as icons, menus, or pointers.

Now, we need to define the terms relevant to the context of the problem: Basketball. Since the application requires to show the most relevant statistics for each player, we need to first understand and delimit which are these aforementioned stats. Apart from name, team, position, and age; project *Five Thirty Eight* breaks each player’s stats into 5 major categories: vitals, corresponding to weight, height, and the draft position (on the year they were drafted); scoring, divided into True Shooting Percentage, Free Throw Percentage, and Usage Percentage; Tendencies, which correspond to the frequency of 3-point and free throws; ball handling, which are the assists and turnover percentages; and defence and rebounding, broken into the rebound, block, and steal percentages, and a defensive +/- number, corresponding to their 2019 RAPTOR model (FiveThirtyEight, 2021).

Additionally, the model they use to rate the players also provides a category for the player (the exact way the categories is rather loosely understood by us at the time of writing), divided from our understanding as such: *prospect* (good and OK), *starters* (good and average), and several special categories consisting in *all-star*, *Future all-*star, *MVP-candidate*, *key role player*, *up-and-comer*, and finally, *scrappy-veteran*. The metric they use to weight the averages in the previous paragraph depends on whether or not the player is a prospect, and therefore a rookie, in which case an “Adjusted College Statistics” measurement is used. Be the player not a rookie, then a weighted average is used taking the last 3 seasons into account (FiveThirtyEight, 2021).

Several other useful statistics are listed and defined in the website *Basketball References*, as well as their respective formulas and abbreviations. With this in mind, the following terms are deemed as relevant to the problem:

*True Shooting Percentage*: A measure of shooting efficiency that considers field goals, 3-point field goals, and free throws. Its formula is given by dividing the number of points scored by the player, by double the true shooting attempts. Its abbreviation is “TS%”.

*True Shooting Attempts*: Given by the product of the field goal attempts, including both 2-field and 3-field attempts augmented by 0.44 units, and the number of free throw attempts.

*Free Throw Percentage*: The ratio of free throws scored to attempted given in percentage. Its abbreviation is “FT%”.

*Usage Percentage*: An estimate of the percentage of team plays correctly used by a player while he was on the court. Given by adding the true shooting attempts and the number of turnovers, multiplying that value by the division of the number of minutes the team has played by 5, dividing that product by the product of the minutes played and sum of the team’s true shooting attempts and their turnovers, and multiplying the resulting value by 100. Abbreviated as “USG%”.

*Assist*: A pass or play executed by a player that immediately or consequently leads to a point scored by a fellow teammate.

*Assist Percentage*: An estimated percentage of teammate field goals a player assisted while he was on the court. Given by finding the product of dividing the minutes played by the division of the number of minutes the team has played by 5, and the team field goals, minus the player’s field goals, dividing the assists of a player by this newfound product and multiplying it by 100. Abbreviated as “AST%”.

*Turnover*: Occurs when a team loses the ball to the opposing team, be it by stepping out of boundaries, rebounds, fouls, among many others.

*Turnover Percentage*: Given by dividing the number of turnovers by the sum of the free throw attempts and the turnovers, and then multiplying by 100. Abbreviated with “TOV%”.

*Rebound*: A grabbed missed shot is qualified as a rebound. It can either be grabbed by the offending team (offensive rebound) or the defending team (defensive rebound) (Leadoff Digital, 2015).

*Total Rebounds per Game*: The average number of secured rebounds (offensive and defensive) per game by a player. Abbreviated as “TRB”.

*(Total) Rebound Percentage*: Given by taking the product of TRB and the division of the number of minutes the team has played by 5, dividing this product by another product, gotten from the number of minutes played and the sum of the team’s and their opponents total rebounds; and finally multiplying by 100. Abbreviation is “TRB%”.

*Block*:

*Block Percentage*:

*Steal*:

*Steal Percentage*:

*Prospect*:

*Starter*:

*Veteran*:

*All-Star*:

All of the above definitions and formula were taken from the website *Basketball References* unless stated otherwise (Sports Reference LLC, n.d.).

## Solution Proposal

## Solution Selection

## Design Drafts

## Final Report and Specifications