
# NUST COLLEGE OF ELECTRICAL AND MECHANICAL ENGINEERING

## *DATABASE ENGINEERING*

## Project Documentation

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# ABSTRACT:

*This document presents the issues of the database project entitled 'Soccer Database'. Its aim is to formally describe the phases of the design and development. These phases are categorized into 3 main steps: Database, Graphic User Interface and Application. The database itself is made on Microsoft SQL Server and the GUI is made on Windows Forms coded in C#, the expected out can range from players, countries, matches and their scoring.*

# INTRODUCTION:

The aim of this database was to design a generic functional database that is relational. The application itself has to store the information about the countries, their teams, players, venue and scoring. The Soccer database is meant for tournament database managers, club managers or live game television engineers for displaying of live data on screen, where this database acts as the base. The initial aim was to create a database with update, delete and add queries for all our major entities but due to a short amount of time, the group has implemented the following functionalities:

- Add, delete, update and display of players
- Display of generic country information

The above given functionalities are also shown on GUI. The application was designed keeping in mind the GUI itself and the proper display functionalities for it. As far as further functionalities are considered, they can be added in this vast database such as:

- Add, update, delete and display of countries
- Add, update, delete and display of venues
- Report generation for scoring and prediction statistics
- Bulk storage for record purposes
- Addition of sponsors and sponsor maintenance
- Error detection in application

# RELATED RESEARCH:

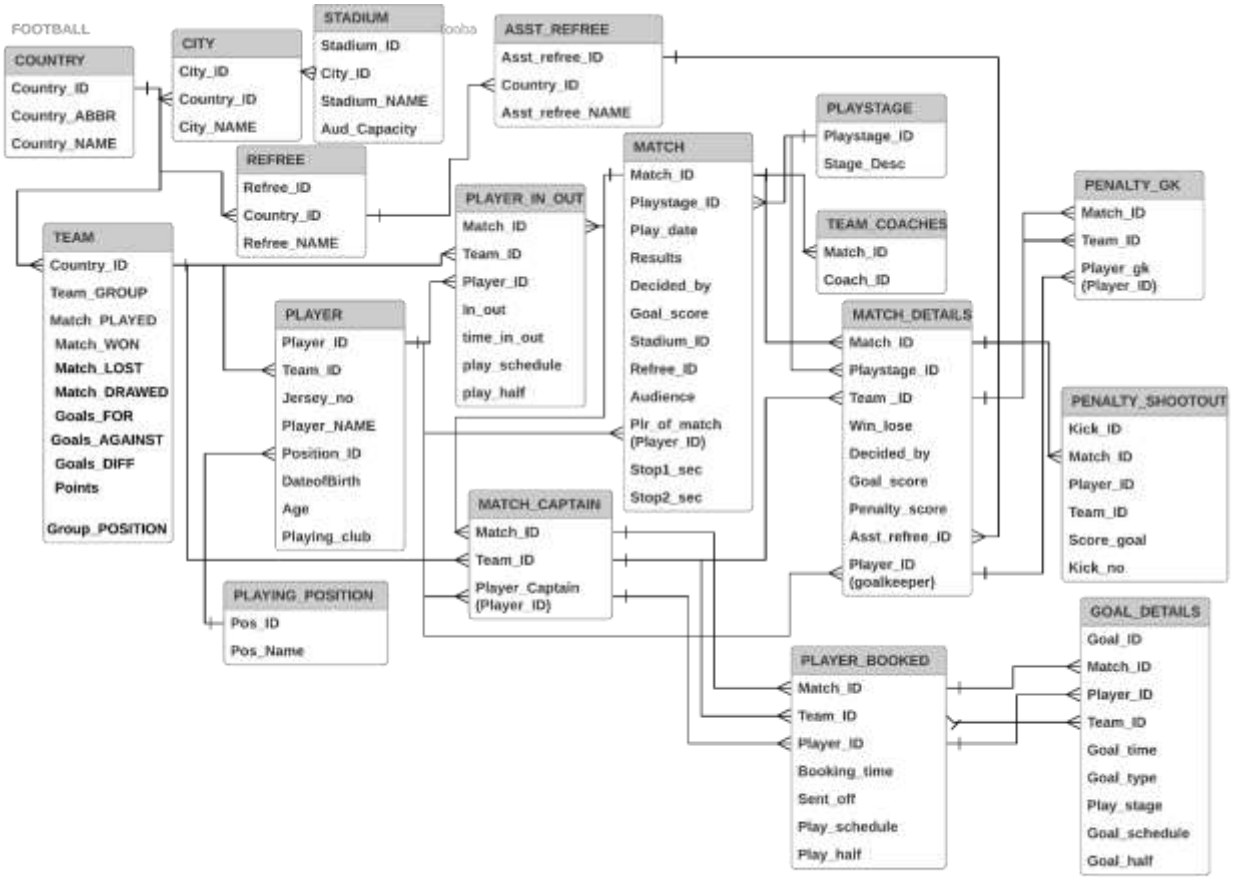
The research conducted for this specific database was regarding the functioning of a generic football game and the required information needed to transform it into a documentational standstill. We shall be discussing about the topics that required extensive research and the topics that we were prepared for from the course itself which contributed in this project.

The courses itself focused on SQL and queries hence provided us with a base to structure an arbitrary game into a relational database and to extract necessary information required after researching on the game itself.

The topics that required extensive research were the working of the game and the learning of a new programming language C# to implement the database GUI and structure it into a functional application.

Secondly the requirement of this database is indeed very important as sports in todays world isn't just a game restricted to a ground and a set of rules now, sports is now a massive international industry with millions in flow, especially considering football, one of the most watched and sought for sports in the world, covered by and broadcasted all over the world with a massive fan-base, requires a structures and functional record mechanism, in or out of game.

# ARCHITECTURE:




The above ERD is in 3rd normal form in its present state, following is the relational model that was implemented in the front-end only for the functionalities we performed i.e. Players and their links.

Below are the table details with their primary keys, foreign keys and fields

***football_country:***

- **PK** country_id – this is a unique ID for each country
- country_abbr – this is the short name of each country
- country_name – this is the name of each country

***football_city:***

- **PK** city_id – this is a unique ID for each city

- city – this is the name of the city
- **FK** country_id – this is the ID of the country where the cities are located and only those countries will be available which are in football_country table

***football_stadium:***

- **PK** stadium_id – this is a unique ID for each stadium
- co_name – this is the name of the stadium
- **FK** city_id – this is the ID of the city where the stadium is located and only those cities will be available which are in the football_city table
- aud_capacity – this is the capacity of audience for each stadium

***football_team:***

- **FK** team_id – this is the ID for each team. Each team is representing a country referencing the country_id column of football_country table

team_group – the name of the group in which the team belongs

- match_played – how many matches a team played in group stage
- won – how many matches a team won
- draw – how many matches a team draws
- lost – how many matches a team lose
- goal_for – how many goals a team conceded
- goal_against – how many goals a team scored
- goal_diff – the difference of goal scored and goal conceded
- points – how many points a team achieved from their group stage matches
- group_position – in which position a team finished their group stage matches

***playing_position:***

- **PK** position_id – this is a unique ID for each position where a player played
- position_desc – this is the name of the position where a player played

***player:***

- **PK** player_id – this is a unique ID for each player
- **FK** team_id – this is the team where a player played, and only those teams which referencing the country_id column of the table football_country

- jersey_no – the number which is labeled on the jersey for each player
- player_name – name of the player
- **FK** posi_to_play – the position where a player played, and the positions are referencing the position_id column of playing_position table
- dateOfBirth – date of birth of each player
- age – approximate age at the time of playing the tournament
- playing_club – the name of the club for which a player was playing at the time of the tournament

***referee:***

- **PK** referee_id – this is the unique ID for each referee
- referee_name – name of the referee
- **FK** country_id – the country, where a referee belongs and the countries are those which referencing the country_id column of football_country table

***playStage:***

- **PK** play_stage – this is the play stage of a match
- stage_desc – this is description of each play stage

***match:***

- **PK** match_no – this if the unique ID for a match
- **FK** play_stage – this indicates that in which stage a match is going on, i.e. G for Group stage, R for Round of 16 stage, Q for Quarter final stage, S for Semi Final stage, and F for Final and it will be one of the stages referencing the play_stage column of playStage table
- play_date – date of the match played
- results – the result of the match, either win or draw
- decided_by – how the result of the match has been decided, either N for by normally or P for by penalty shootout
- goal_score – score for a match
- **FK** stadium_id – the stadium where the match is played and it will be one of the stadiums referencing the stadium_id column of football_stadium table
- **FK** referee_id – ID of the referee who is selected for the match which referencing the referee_id column of referee table
- audience – number of audience appears to watch the match

- **FK** plr_of_match – this is the player who awarded the player of a particular match and who is selected of 23 man playing squad for a team which referencing the player_id column of player table
- stop1_sec – how much stoppage time ( in seconds) has been added for the 1st half of play
- stop2_sec – how much stoppage time ( in seconds) has been added for the 2nd half of play

***coach:***

- **PK** coach_id – this is the unique ID for a coach
- coach_name – this is the name of the coach

***asst_referee:***

- **PK** asst_ref_id – this is the unique ID for each referee assists the main referee
- asst_ref_name – name of the assistant referee
- **FK** country_id – the country where an assistant referee belongs and the countries are those which are referencing the country_id column of football_country table

***match_details:***

- **FK** match_no – number of the match which is referencing the match_no column of match table
- **FK** play_stage - stage of the match, i.e. G for group stage, R for Round of 16, Q for Quarter Final, S for Semi final and F for final and it will be one of the stages referencing the play_stage column of playStage table
- **FK** team_id – the team which is one of the playing team and it is referencing the country_id column of football_country table
- win_lose – team either win or lose or drawn indicated by the character W, L, or D
- decided_by - how the result achieved by the team, indicated N for normal score or P for penalty shootout
- goal_score – how many goals scored by the team
- penalty_score – how many goal scored by the team in penalty shootout
- **FK** asst_ref – the assistant referee assist the referee which are referencing the asst_ref_id column of asst_referee table
- **FK** player_gk - the player who is keeping the goal for the team, is referencing the player_id column of player table

***goal_details:***

- **PK** goal_id – this is the unique ID for each goal

- **FK** match_no – this is match_no which is referencing the match_no column of match table
- **FK** player_id - this is the ID of a player who is selected for the 23 men squad of a team for the tournament and which is referencing the player_id column of player table
- **FK** team_id – this is the ID of each team who are playing in the tournament and referencing the country_id column of football_country table
- goal_time – this is the time when the goal scored
- goal_type – this is the type of goal which came in normally indicated by N or own goal indicating by O and goal came from penalty indicated by P
- **FK** play_stage – this is the play stage in which goal scored, indicated by G for group stage, R for round of 16 stage, Q for quarter final stage, S for semifinal stage and F for final match and it will be one of the stages referencing the play_stage column of playStage table
- goal_schedule – when the goal came, is it normal play session indicated by NT or in stoppage time indicated by ST or in extra time indicated by ET
- goal_half – in which half of match goal came

***penalty_shootout:***

- **PK** kick_id – this is unique ID for each penalty kick
- **FK** match_no - this is the match_no which is referencing the match_no column of match table
- **FK** team_id – this is the ID of each team who is playing in the tournament and referencing the country_id column of football_country table
- **FK** player_id - this is the ID of a player who is selected for the 23 man squad of a team for the tournament and which is referencing the player_id column of player table
- score_goal – this is the flag Y if able to score the goal or N when not
- kick_no – this is the kick number for the kick of an individual match

***player_booked:***

- **FK** match_no - this is the match_no which is referencing the match_no column of match table
- **FK** team_id – this is the ID of each team who are playing in the tournament and referencing the country_id column of football_country table
- **FK** player_id - this is the ID of a player who is selected for the 23 men squad of a team for the tournament and which is referencing the player_id column of player table
- booking_time – this is the time when a player booked
- sent_off – this is the flag Y when a player sent off

- play_schedule – when a player booked, is it in normal play session indicated by NT or in stoppage time indicated by ST or in extra time indicated by ET
- play_half – in which half a player booked

***player_in_out:***

- **FK** match_no - this is the match_no which is referencing the match_no column of match table
- **FK** team_id – this is the ID of each team who are playing in the tournament and referencing the country_id column of football_country table
- **FK** player_id - this is the ID of a player who is selected for the 23 men squad of a team for the tournament and which is referencing the player_id column of player table
- in_out – this is the flag I when a player came into the field or O when go out from the field
- time_in_out – when a player come into the field or go out from the field
- play_schedule – when a player come in or go out of the field, is it in normal play session indicated by NT or in stoppage time indicated by ST or in extra time indicated by ET
- play_half - in which half a player come in or go out

***match_captain:***

- **FK** match_no - this is the match_no which is referencing the match_no column of match table
- **FK** team_id – this is the ID of each team who are playing in the tournament and referencing the country_id column of football_country table
- **FK** player_captain - the player who represents as a captain for a team, is referencing the player_id column of player table

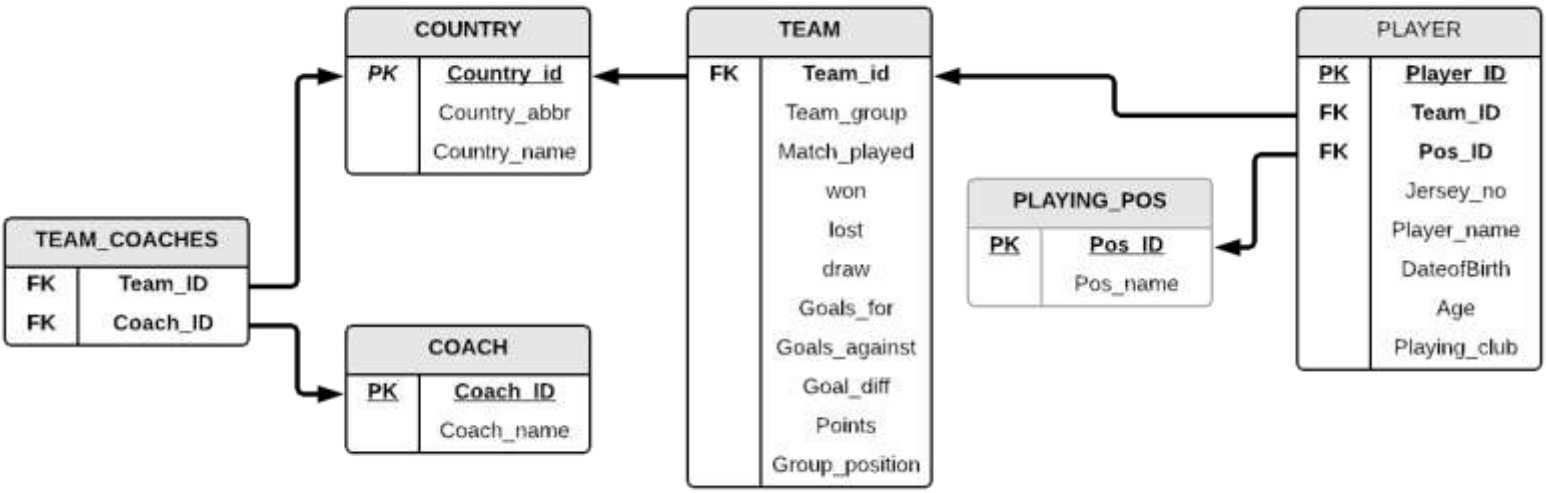
***team_coaches:***

- **FK** team_id – this is the ID of a team who is playing in the tournament and referencing the country_id column of football_country table
- **FK** coach_id – a team may be one or more coaches, this indicates the coach(s) who is/are coaching the team is referencing the coach_id column of coach table

***penalty_gk:***

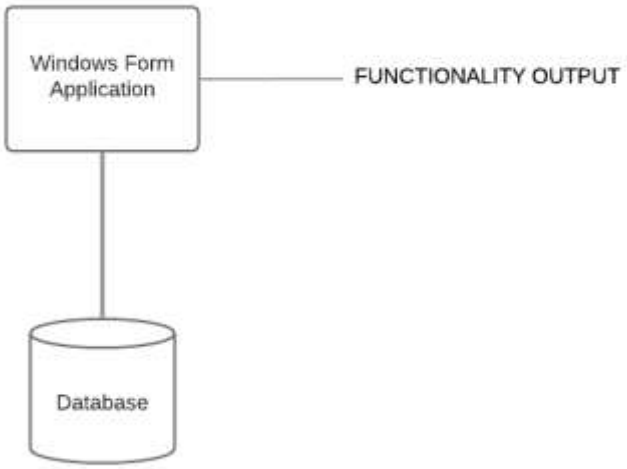
- **FK** match_no - this is the match_no which is referencing the match_no column of match table
- **FK** team_id – this is the ID of each team who are playing in the tournament and referencing the country_id column of football_country table
- **FK** player_gk - the player who kept goal at the time of penalty shootout, is referencing the player_id column of player table

**RELATIONAL MODEL (FOR FUNCTIONALITIES IMPLEMENTED IN GUI):**




# FUNCTIONALITY DESIGN:

The functionality design initially contained the design of database and proper mapping out of tables and their relations in order to properly structure the database for further query functionalities. After the database was ready, it was then linked to Windows Forms via Visual studio and then the front end was designed in order to display the functionalities that were set as the goal. This flowchart that represents our overall view of the project




# IMPLEMENTATION APPROACH:

## 1. Technologies

## • Microsoft SQL Server Management Studio

For the designing of the database, a near of 19 tables were created in the actual database and variable names and primary keys were assigned to the respective tables, following are a few queries that run in the SQL Management Studio to provide us with a backend for the project:

```
CREATE TABLE football_team(team_id int UNIQUE NOT NULL,
            team_group char(1) NOT NULL,
            match_played int NOT NULL,
            won int NOT NULL,
            draw int NOT NULL,
            lost int NOT NULL,
            goal_for int NOT NULL,
            goal_against int NOT NULL,
            goal_diff int NOT NULL,
   points int NOT NULL,
            group_position int NOT NULL,
            CONSTRAINT football_team_FK FOREIGN KEY(team_id) references football_country(country_id),
            CONSTRAINT group_AtoF CHECK(team_group IN ('A', 'B', 'C', 'D', 'E', 'F')),
            CONSTRAINT numberMatches CHECK(match_played = 3 AND match_played = won+draw+lost),
            CONSTRAINT numberGoals CHECK((goal_for BETWEEN 0 and 31) AND (goal_against BETWEEN 0
AND 31) AND goal_diff = goal_for-goal_against),
            CONSTRAINT numberPoints CHECK(points <=9 AND points = 3*won + draw),
            CONSTRAINT groupPOSN CHECK(group_position BETWEEN 1 AND 4)
);
```

```
CREATE DATABASE WorldCup;
CREATE TABLE football_country(
        country_id int UNIQUE NOT NULL IDENTITY(1200,1),
        country_abbr varchar(3) UNIQUE NOT NULL,
        country_name varchar(40) UNIQUE NOT NULL,
        CONSTRAINT football_country_PK PRIMARY KEY(country_id),
        );
```

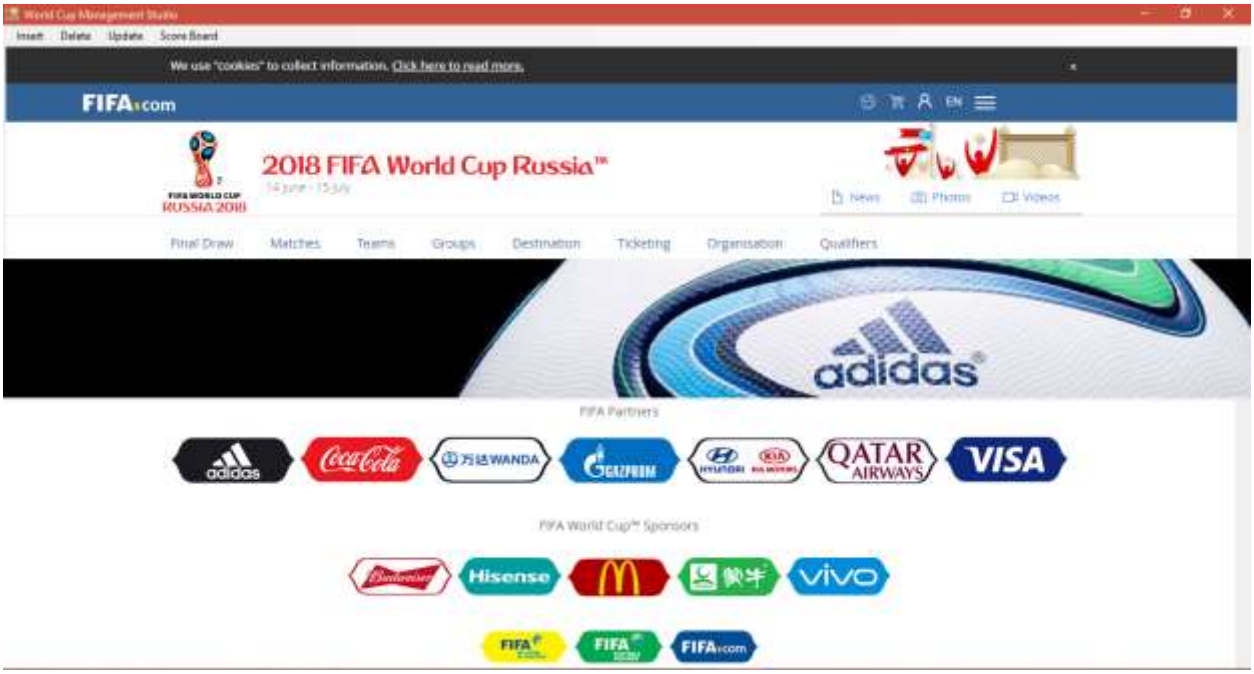
**•Microsoft Visual Studio Windows Forms**

For the designing of the GUI and linking, windows forms were used, the respective functionality was mapped out and then implemented using forms, the database was initially linked with the form so that the data also changed in the database on updation, deletion and addition. Following is a function from .net forms that implements the database

```
private void button1_Click(object sender, EventArgs e)
      {
 int tid = Convert.ToInt32(textBox2.Text);
int jid=Convert.ToInt32(textBox3.Text);
int age = Convert.ToInt32(textBox7.Text);
SqlConnection con = new SqlConnection("Data Source=DESKTOP-IIMNFAB\\SQLEXPRESS;user id=sa
;password = M@hw!sh36;Initial Catalog=WorldCup");
con.Open();
SqlCommand cmd=new SqlCommand(@"INSERT INTO [WorldCup]. [dbo].[player]
([team_id]
,[jersey_no]
,[player_name]
[posi_to_play]
[dateOfBirth]
[age]
[playing_club])
VALUES
 ('" + tid + "','" + jid + "','" + textBox4.Text + "','" + textBox5.Text + "','" + textBox6.Text + "','"+age+"' ,'" +
textBox8.Text + "')", con);
cmd.ExecuteNonQuery();
 con.Close();
 MessageBox.Show("Record is sucessfully inserted", "Completed");
LoadData();
      }
```

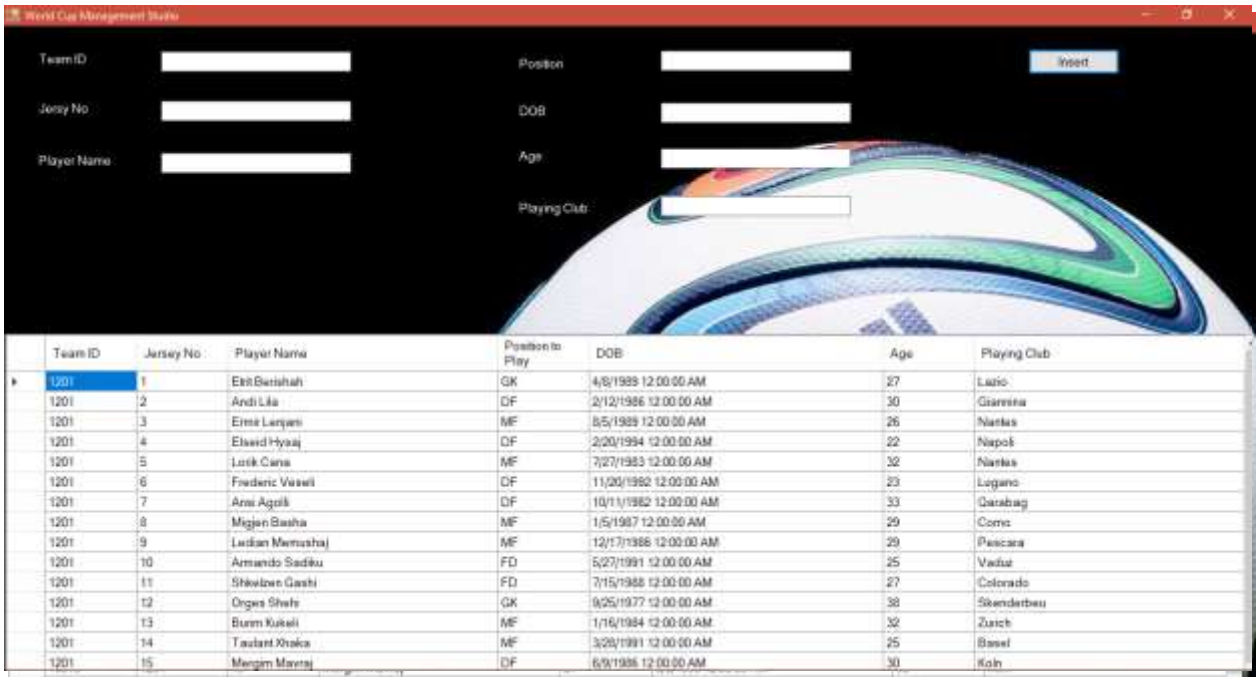
# 2. User Manual

This is GUI is set for the functionality of adding, removing or updating a specific player, the interface starts with a username and password for added security to access the database

This the main page of the interface, further we are guided to the Players section

The players functionalities support addition, deletion and updation of players, following are the screenshots of the forms for the respective functions




| Team ID | Jersey No | Player Name | Position to Play | DOB | Age | Playing Club |
|---|---|---|---|---|---|---|
| 1201 | 1 | Etit Berishah | GK | 4/8/1989 12:00:00 AM | 27 | Lazio |
| 1201 | 2 | Andi Lila | DF | 2/12/1986 12:00:00 AM | 30 | Giannina |
| 1201 | 3 | Ermir Lenjani | MF | 8/5/1989 12:00:00 AM | 26 | Nantes |
| 1201 | 4 | Elvaid Hyasj | DF | 2/20/1994 12:00:00 AM | 22 | Napoli |
| 1201 | 5 | Lorik Cana | MF | 7/27/1983 12:00:00 AM | 32 | Nantes |
| 1201 | 6 | Frederic Veseli | DF | 11/20/1992 12:00:00 AM | 23 | Lugano |
| 1201 | 7 | Arsi Agolli | DF | 10/11/1982 12:00:00 AM | 33 | Qarabag |
| 1201 | 8 | Migjen Basha | MF | 1/5/1987 12:00:00 AM | 29 | Como |
| 1201 | 9 | Ledian Memushaj | MF | 12/17/1986 12:00:00 AM | 29 | Pescara |
| 1201 | 10 | Armando Sadiku | FD | 5/27/1991 12:00:00 AM | 25 | Vaduz |
| 1201 | 11 | Shkelzen Gashi | FD | 7/15/1988 12:00:00 AM | 27 | Colorado |
| 1201 | 12 | Orges Shehi | GK | 9/25/1977 12:00:00 AM | 38 | Skenderbeu |
| 1201 | 13 | Burim Kukeli | MF | 1/16/1984 12:00:00 AM | 32 | Zurich |
| 1201 | 14 | Taulant Xhaka | MF | 3/28/1991 12:00:00 AM | 25 | Basel |
| 1201 | 15 | Mergim Mavraj | DF | 6/9/1986 12:00:00 AM | 30 | Koln |

# CONCLUSION:

So in order to conclude the work done, the whole project was divided in 2 phases, first the construction of the database and second the development of the GUI on C forms, the research done was done to ensure the flow of storage correspond to the ideal game record correspondence in order to be a logically approached database.