

## Databases

Homework 3: Develop a Database System for Your Domain

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Domain: Soccer Cup

### Introduction

This document contains the homework of Edward Student. The task was to perform Homework 3

1. **Step 1:** Specify the Mission & Objectives for your DBS:

#### Mission Statement

Input: HW1, HW2

For this step I have done previous homeworks 1 and 2.

Step 1

##### 1.1 Mission Statement for a Soccer Cup DBS

To justify the design and development of a Soccer Cup DBS, it is necessary to identify:

- Which recurring processes need to be automated and why
- Who the stakeholders are and how they benefit
- How benefits will be assessed in terms of operational improvements

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##### 1.1.a Stakeholders

A Soccer Cup is an organized football competition in which multiple teams compete across a series of scheduled matches. A tournament is initiated and managed by a **Tournament Organizer**, who is responsible for setting up the structure of the competition, registering participating teams, and overseeing the scheduling of matches.

Each **Team** is represented by a **Team Manager**, who handles the administrative aspects of the team's participation, including registration and providing basic team details. Matches between teams are logged and tracked by the system to maintain a consistent and complete competition record.

### 1.1.b Scoping

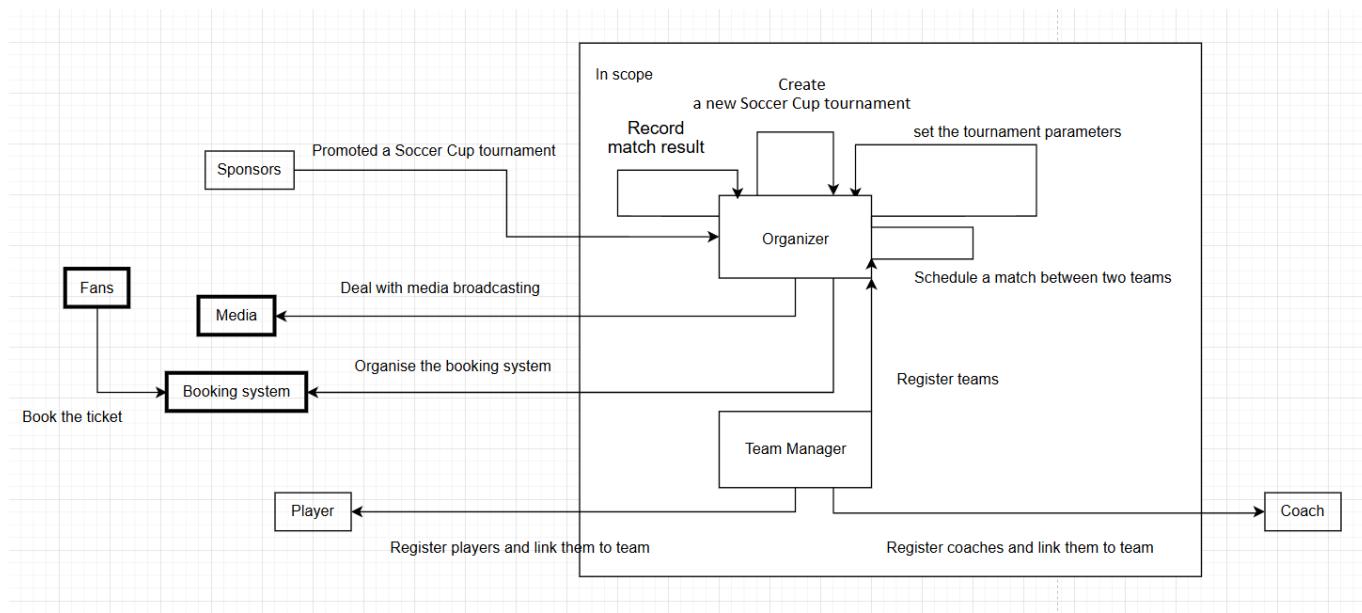
To understand which part of the Soccer Cup domain is covered by the DBS, we must map relevant processes and stakeholders into the system scope. For Soccer Cup DBS, the relevant processes and stakeholders are

#### In scope:

- Tournament Organizers
- Team Managers

#### Out of scope:

- Players
- Coaches
- Media
- Fans
- Sponsors
- External systems (ticketing, payment, etc.)



## **1 Pre-Tournament – Cup Setup & Team Registration**

- 1.1 Create and configure a new tournament (Stakeholder: Organizer)
  - 1.2 Register teams to participate (Stakeholder: Team Manager)
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## **2 Tournament Phase – Match Scheduling & Results**

- 2.1 Schedule matches between teams (Stakeholder: Organizer)
  - 2.2 Record final match results (Stakeholder: Organizer)
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### **2.1.1.d Part of Soccer Business Covered**

The planned Soccer Cup DBS will cover the following regular processes:

- Creating and configuring a Soccer Cup tournament
- Registering teams
- Scheduling matches
- Recording match results

This represents the **core administrative part of tournament operations** and leaves out in-depth player or venue management, ticketing, or fan interaction.

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### **2.1.1.e Why required and how are the improvement indicators estimated?**

Without automating this portion of soccer tournament management, organizers and team managers currently rely on **paper-based documents, spreadsheets, and email communication**. This leads to:

- Increased setup time
- Risk of data inconsistency
- Miscommunication between teams and organizers
- Lack of historical and statistical insights

**With the introduction of the Soccer Cup DBS:**

- Tournament setup time can be reduced
- Team data and match scheduling will be centralized and standardized
- Match results will be stored immediately and made accessible to authorized users

- Future add-ons (like player tracking, fan dashboards) can be integrated into the solid foundation already built
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## **2.2 Step 2: Mission Objectives**

Mission objectives describe what the DBS must achieve at a task level. Each objective identifies a task, the operations it includes, the required input/output documents, and the goal of automating or supporting the task.

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### **2.2.1 Example: Mission Objectives for Soccer Cup DBS**

Let's examine the in-scope processes. Each process is treated as an information flow. We describe the operations involved, required inputs, and resulting outputs.

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#### **2.2.1.a Tournament Setup (TS)**

**Stakeholder involved:** Organizer

##### **O1: Create a new Soccer Cup tournament**

- This operation is performed manually by the Organizer using the DBS
- Input document: Cup name, year, host country
- Output document: Tournament configuration summary
- Objective: Define and register a new tournament

##### **O2: Add tournament general details**

- This operation is performed manually by the Organizer
  - Input document: Number of teams, planned start date
  - Output document: Configured tournament record
  - Objective: Store essential parameters for scheduling and team registration
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#### **2.2.1.b Team Registration (TR)**

**Stakeholder involved:** Team Manager

##### **O3: Register a new team**

- This operation is done manually by the team manager
- Input document: Team name, home country

- Output document: Team entry linked to current tournament
  - Objective: Ensure all participating teams are properly recorded

### **2.2.1.c Match Management (MM)**

**Stakeholder involved:** Organizer

## O4: Schedule a match

- This operation is done manually by the Organizer
  - Input document: Team A, Team B, match date and time
  - Output document: Match\_record
  - Objective: Create and manage match fixtures

## O5: Record match result

- This operation is done manually by the Organizer
  - Input document: Match ID, final score
  - Output document: Match report
  - Objective: Track and store outcomes for each match

## **2.2.1.d Mission Objectives Summary**

**Mission objectives for the Soccer Cup DBS constitute the following list:**

- Define and register the basic details of a new tournament
  - Set tournament parameters for scheduling and registration
  - Register teams and associate them with a specific tournament
  - Schedule matches between registered teams
  - Record match results in a consistent and accessible manner

## **2. Step 2: Elicit Requirements for Your DBS:**

Operation	Involved	Actor	Type	Frequency	Input Docu	Data Obje	Field / Q-ty	Access	Output	Data Obje	Field / Q-ty	Access
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	Stakeholder				ment / Q-ty	ct / Q-ty			Document / Q-ty	ct / Q-ty		
Create new tournament	Organizer	Admin	Interactive	Once per tournament	Tournament Form / 1	SoccerCup / 1	Name / 1, Year / 1, Country / 1	R	Config Summary / 1	SoccerCup / 1	ID / 1, Name / 1, Config / 1	W
Set tournament parameters	Organizer	Admin	Semi-automatic	Once per tournament	Setup Form / 1	SoccerCup / 1	NumTeams / 1, Start Date / 1	R	Tournament Record / 1	SoccerCup / 1	Updated Params / 2	W
Register team	Team Manager	Manager	Interactive	Once per team	Team Registration Form / 1	Team / 1	Team Name / 1, Country / 1	R	Registered Team / 1	Team / 1	ID / 1, Name / 1	W
Schedule match	Organizer	Admin	Semi-automatic	Per match (1-n)	Match Planning Form / 1	Team / 2, Match_ / 1	Team A / 1, Team B / 1, DateTime / 1	R	Match Schedule / 1	Match / 1	MatchID / 1, ScheduledTime / 1	W
Record match result	Organizer	Admin	Interactive	After every match	Match Report Form / 1	Match_ / 1	MatchID / 1, Score / 1	R	Match Result / 1	Match / 1	FinalScore / 1, Status / 1	W

I selected the following in-scope operations, that transform the information from the input documents into the output documents:

### Tournament Setup (TS)

#### O1 Create new tournament

- Operation type:** Interactive, performed by the Organizer
- Input document:** Tournament Form (Cup name, year, host country)
- Output document:** Tournament configuration summary
- Objective:** Define and register a new tournament in the system
- Conclusion:** we take this. This is a core part of the tournament workflow and must be included.

## O2 Set tournament parameters

- **Operation type:** Semi-automatic, Organizer confirms pre-filled fields
- **Input document:** Setup Form (Number of teams, planned start date)
- **Output document:** Updated tournament record
- **Objective:** Store additional parameters for tournament configuration and scheduling
- **Conclusion:** we take this. It builds directly on the creation step and is essential for team registration and scheduling.

## Register a new team

- **Operation type:** Interactive, performed by the Team Manager
- **Input document:** Team Registration Form (Team name, home country)
- **Output document:** Team entry associated with a tournament
- **Objective:** Ensure all participating teams are formally registered
- **Conclusion:** We take that. This operation is vital to populate the tournament with teams

## Match Management (MM)

### Schedule a match

- **Operation type:** Semi-automatic, Organizer inputs teams and time
- **Input document:** Match Planning Form (Team A, Team B, DateTime)
- **Output document:** Scheduled match record (Match\_)
- **Objective:** Create and manage match fixtures
- **Conclusion:** Core function that transforms team info and scheduling data into match records. Needed for organizing the competition structure.

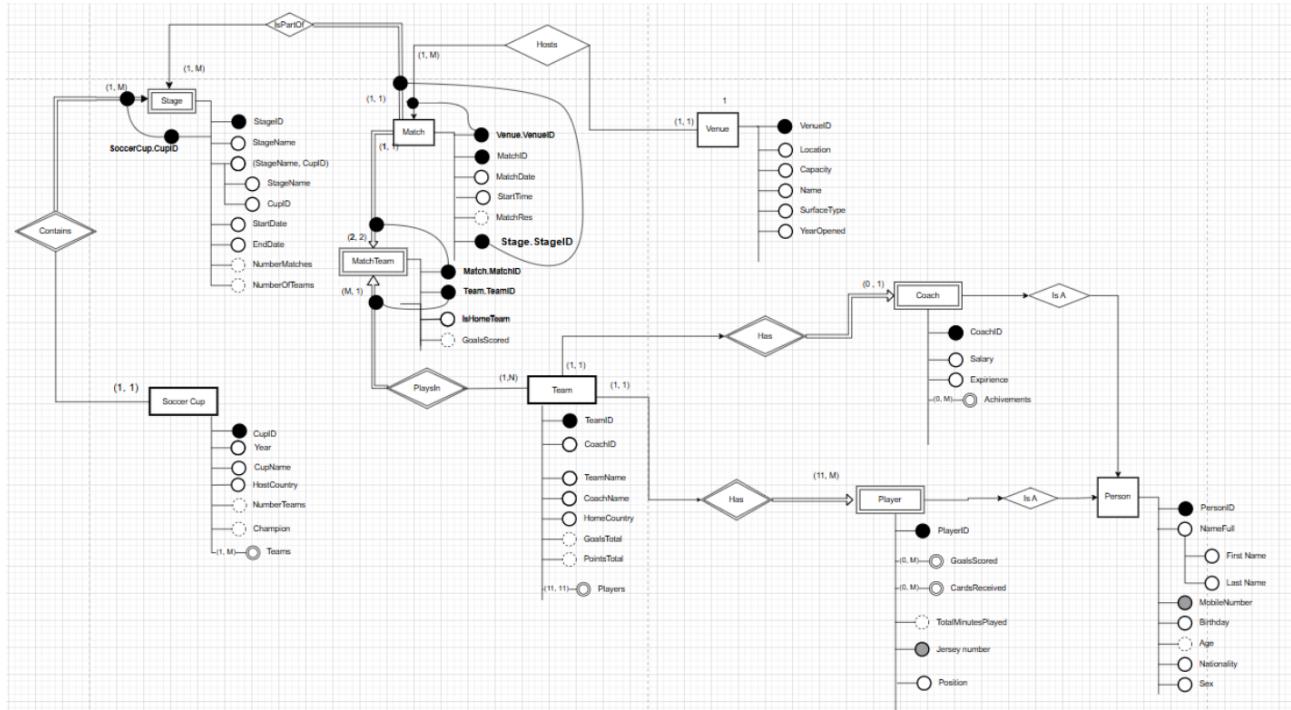
### Record match result

- **Operation type:** Interactive, performed by the Organizer
- **Input document:** Match Report Form (MatchID, Score)
- **Output document:** Match report with final score and status
- **Objective:** Track and store official match outcomes
- **Conclusion:** Essential for updating the system with match results, influencing standings and stats (future extensions).

Input: HW1, step 1, step 2

ER diagram:

Here is finished the ER diagram from the first homework.



I need the following list of stakeholders:

Organiser

Team Manager

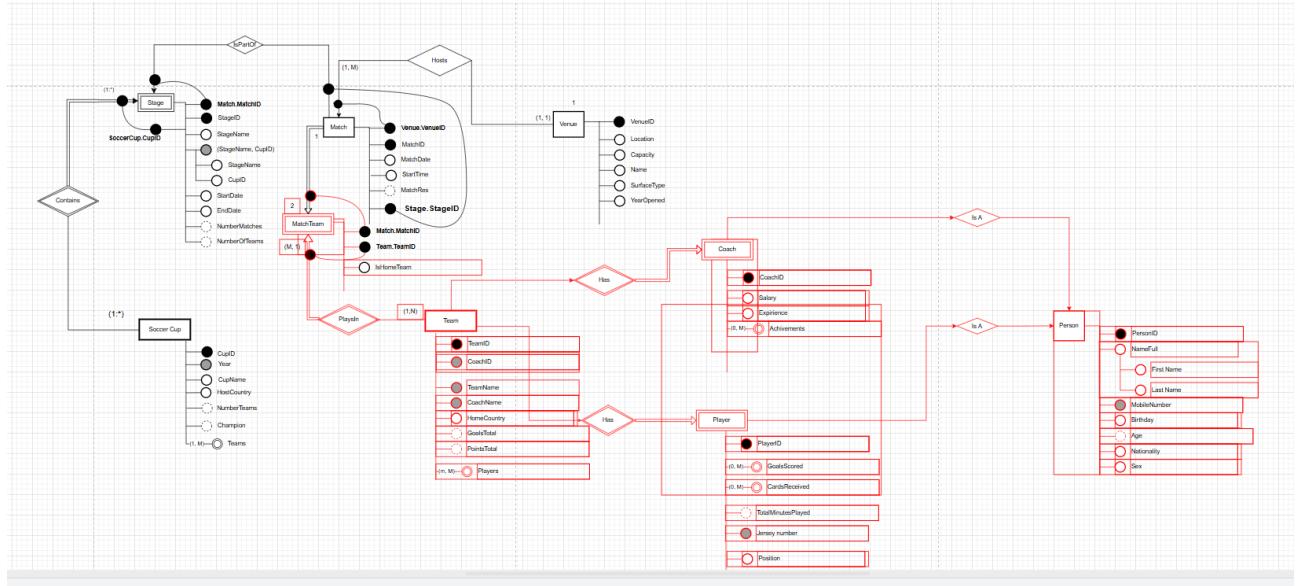
Initially my ER-diagram doesn't have the Organiser or the Team Manager entity, but to provide the complete functionality of my database I need to implement them. Because there should be someone who will take control on the DB and I need to give a role to them. So now I need to think what can I observe and what can I add to my diagram.

The current mission:

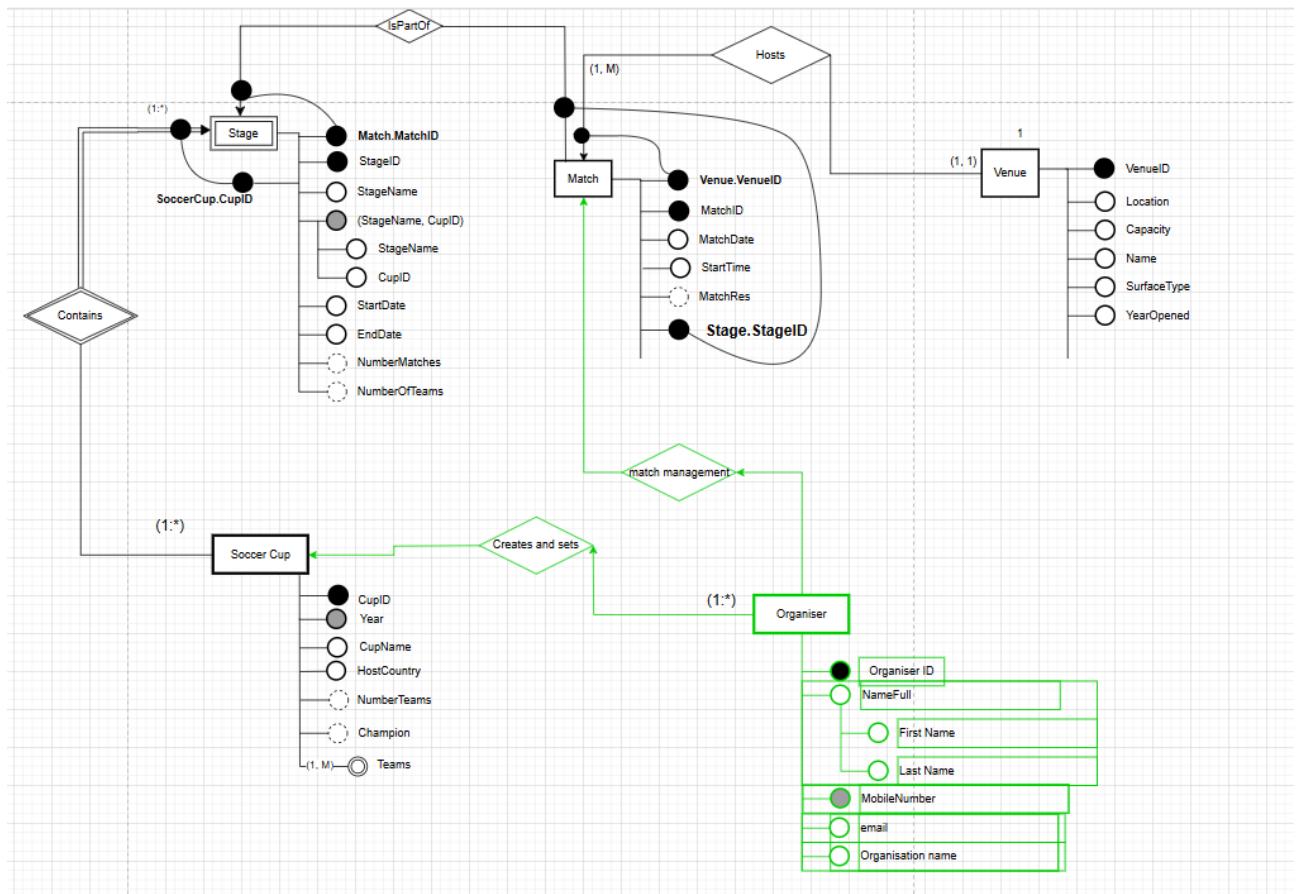
- 1) Set Tournament
- 2) Team management
- 3) Match management

External view for Organiser:

The elements which are unused for by Organiser:

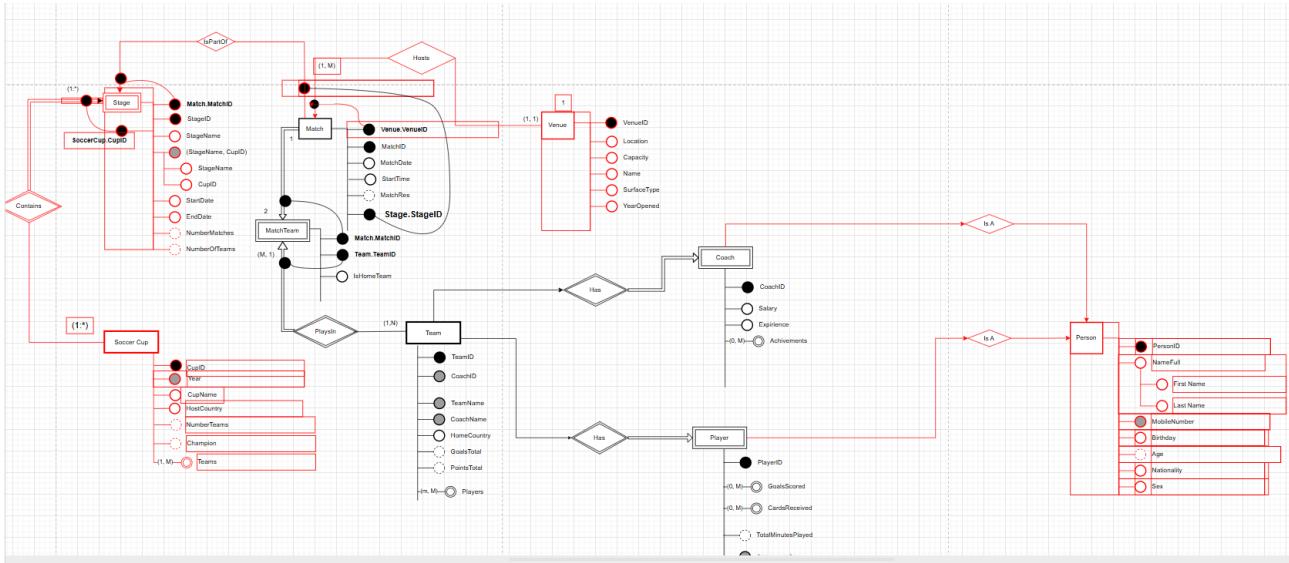


Add Organiser into the conceptual scheme:

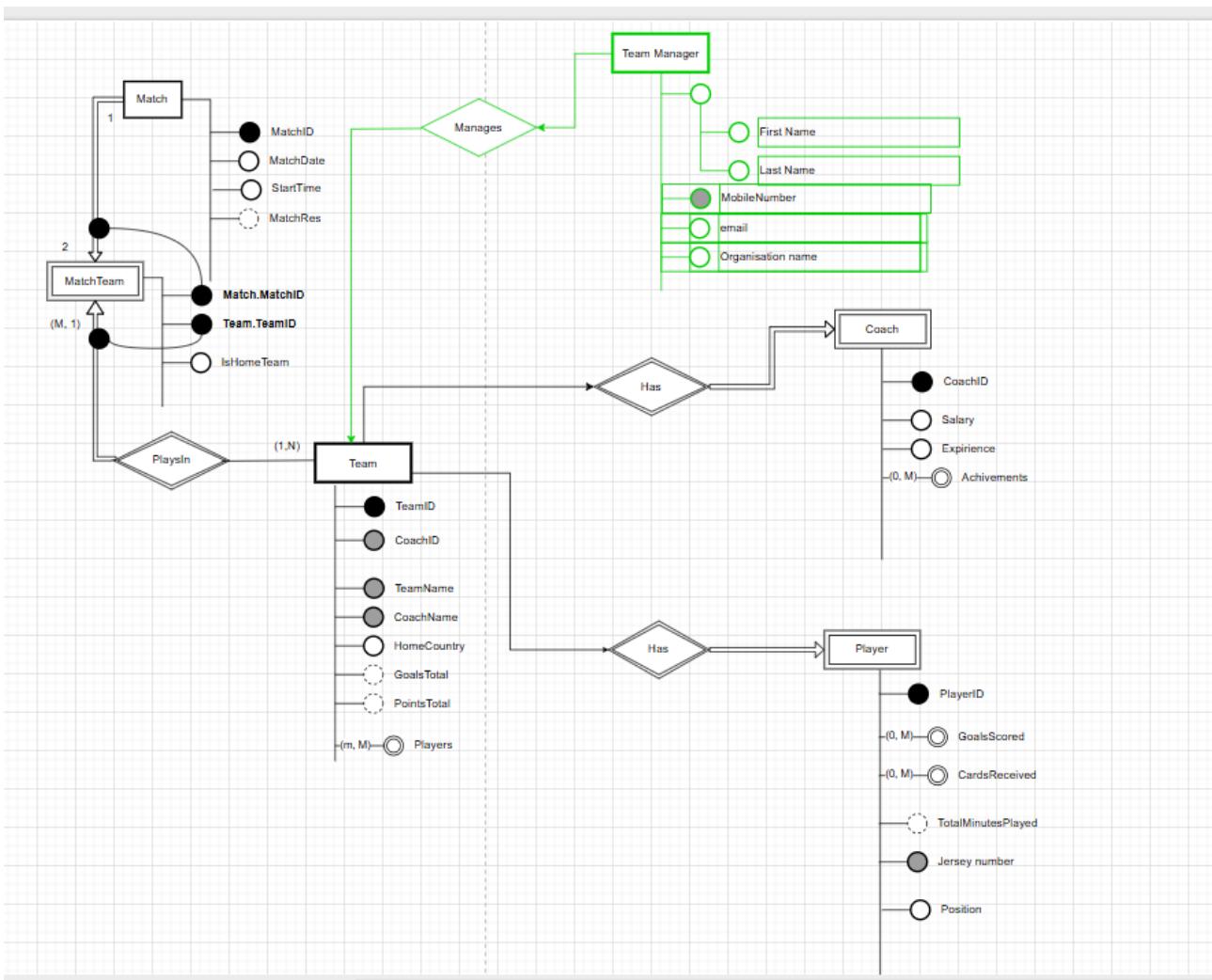


External views for Team Manager:

Elements to remove:

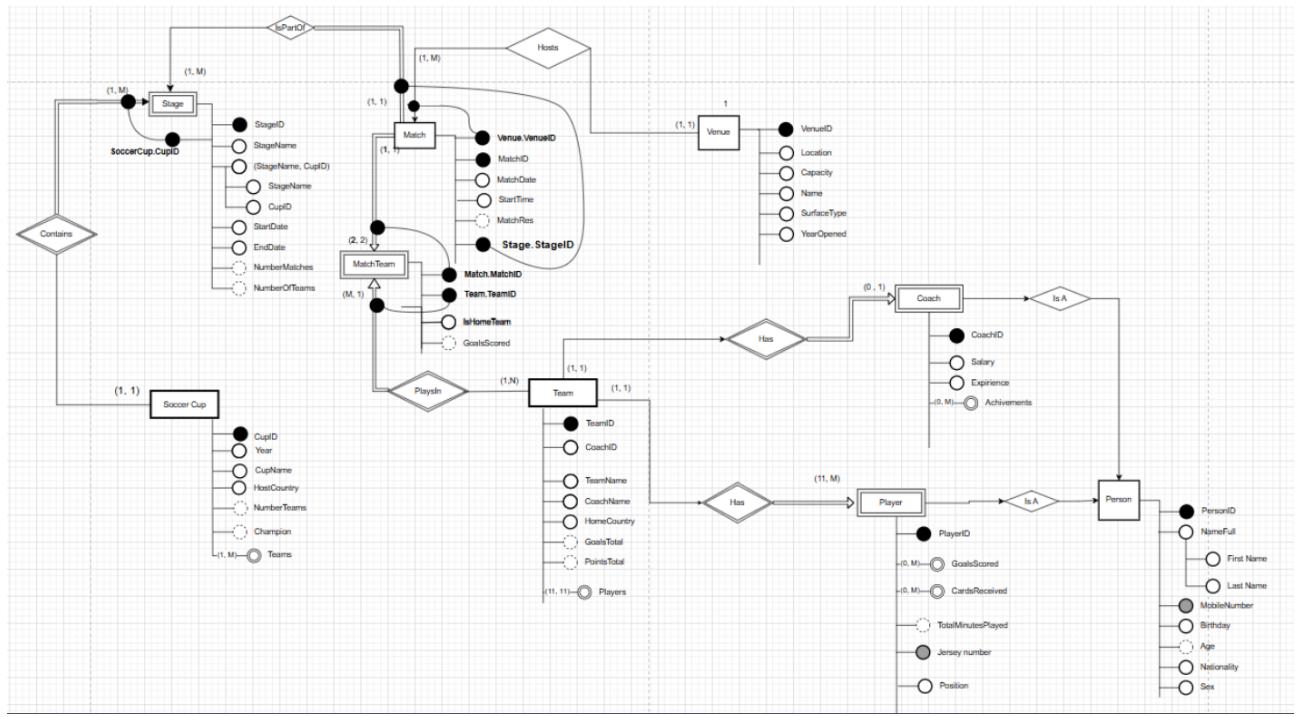


Elements to add:



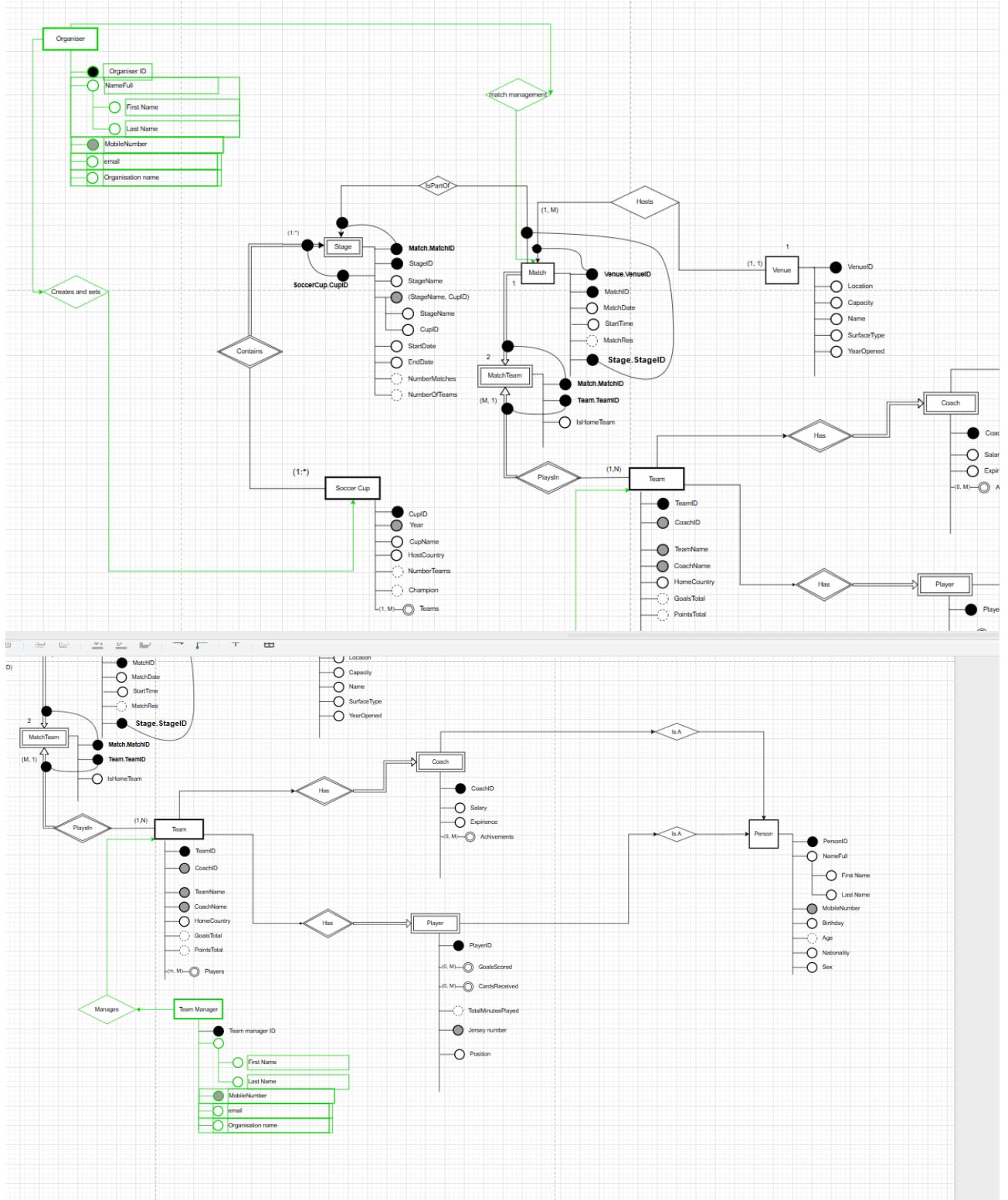
#### Step 4: Refine Your Conceptual Model (HW1) Based on the External Views:

The input HW1 and external views from previous steps:



Merging external views into one entire conceptual model:

There are two screenshots of one conceptual model.



Harmonization of the possible conflicts:

After the merging 2 conceptual models based on different external views, there were no any conflicts.

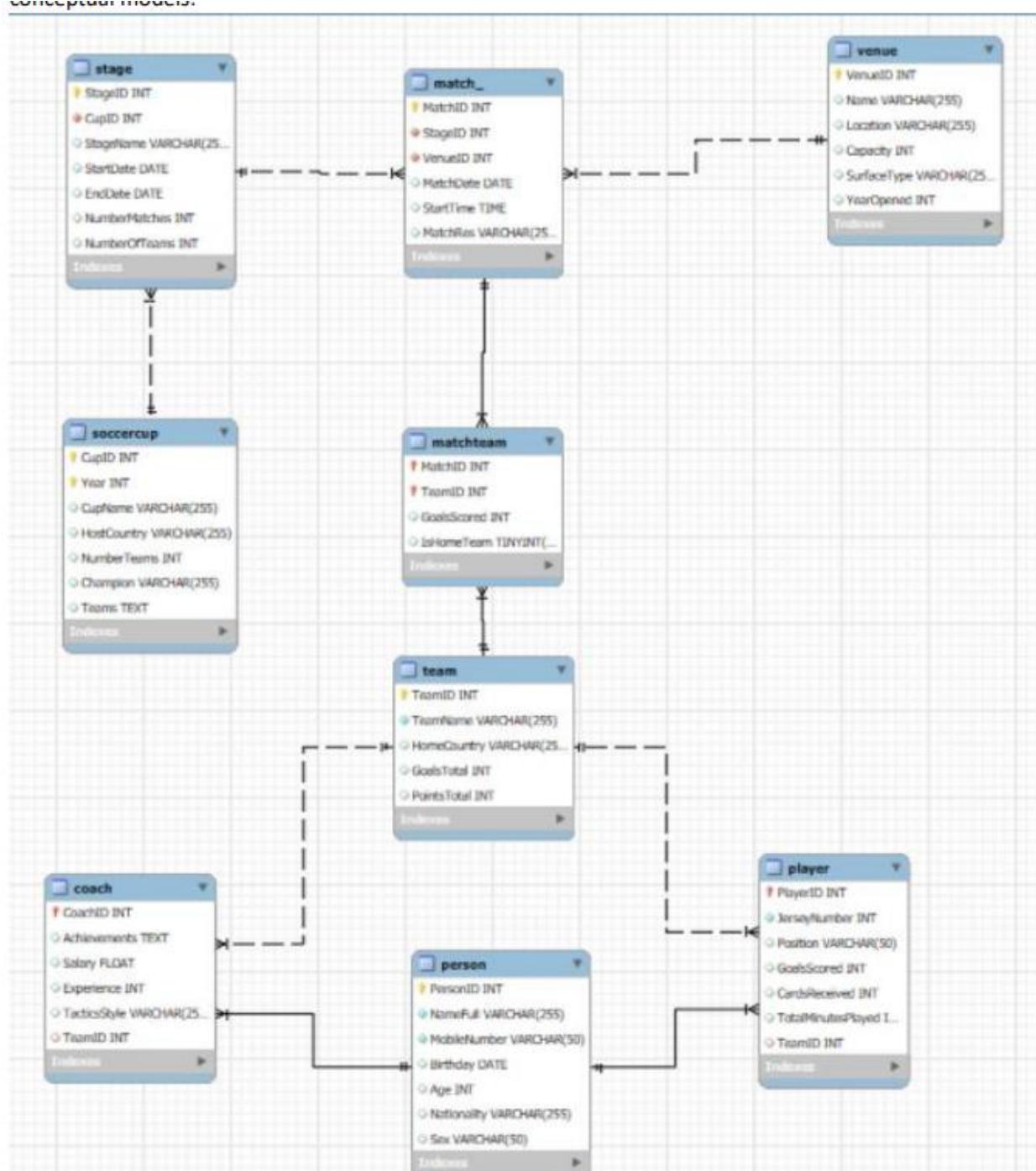
Now we face the following situation. We just add 2 new entity types, which corresponds to our stakeholders and provide the functions from the set of operations. Since the system was completed in structural terms, there was only need in entity types who can execute an access to other ET (who can maintain, set, or create them).

## Step 5 Refine Your Database Schema (HW2) Based on the Elaborated CM

Input: Step 3-4. HW1 modified in previous steps scheme, HW2 models

I created new tables for my database based on new conceptual model from modified HW1 (modified in 3, 4 steps) and Homework 2 model:

My initial logical diagram created in MySQL WorkBench:



Now, after some modifications of my HW1 conceptual model I can modify my Logical model:

I added new entities for Organiser and for Team Manager. And make relations:

Organiser:

Organiser -> match management -> match

Organiser -> Creates and sets -> Soccer Cup

Team Manager -> Manages -> Team

Below you can see MySQL, which represents adding a new entities:

```

14
15 CREATE TABLE Organiser (
16     OrganiserID INT PRIMARY KEY NOT NULL COMMENT 'Organiser identifier',
17     FirstName VARCHAR(100) NOT NULL COMMENT 'First name of the organiser',
18     LastName VARCHAR(100) NOT NULL COMMENT 'Last name of the organiser',
19     MobileNumber VARCHAR(50) NOT NULL COMMENT 'Mobile phone number',
20     Email VARCHAR(255) NOT NULL COMMENT 'Email address',
21     OrganisationName VARCHAR(255) COMMENT 'Organisation the organiser represents'
22 ) ENGINE=InnoDB COMMENT='Organiser entity type.';
23
24 CREATE TABLE TeamManager (
25     TeamManagerID INT PRIMARY KEY NOT NULL COMMENT 'Team Manager identifier',
26     FirstName VARCHAR(100) NOT NULL COMMENT 'First name of the team manager',
27     LastName VARCHAR(100) NOT NULL COMMENT 'Last name of the team manager',
28     MobileNumber VARCHAR(50) NOT NULL COMMENT 'Mobile phone number',
29     Email VARCHAR(255) NOT NULL COMMENT 'Email address',
30     OrganisationName VARCHAR(255) COMMENT 'Organisation the manager represents'
31 ) ENGINE=InnoDB COMMENT='Team Manager entity type.';
32

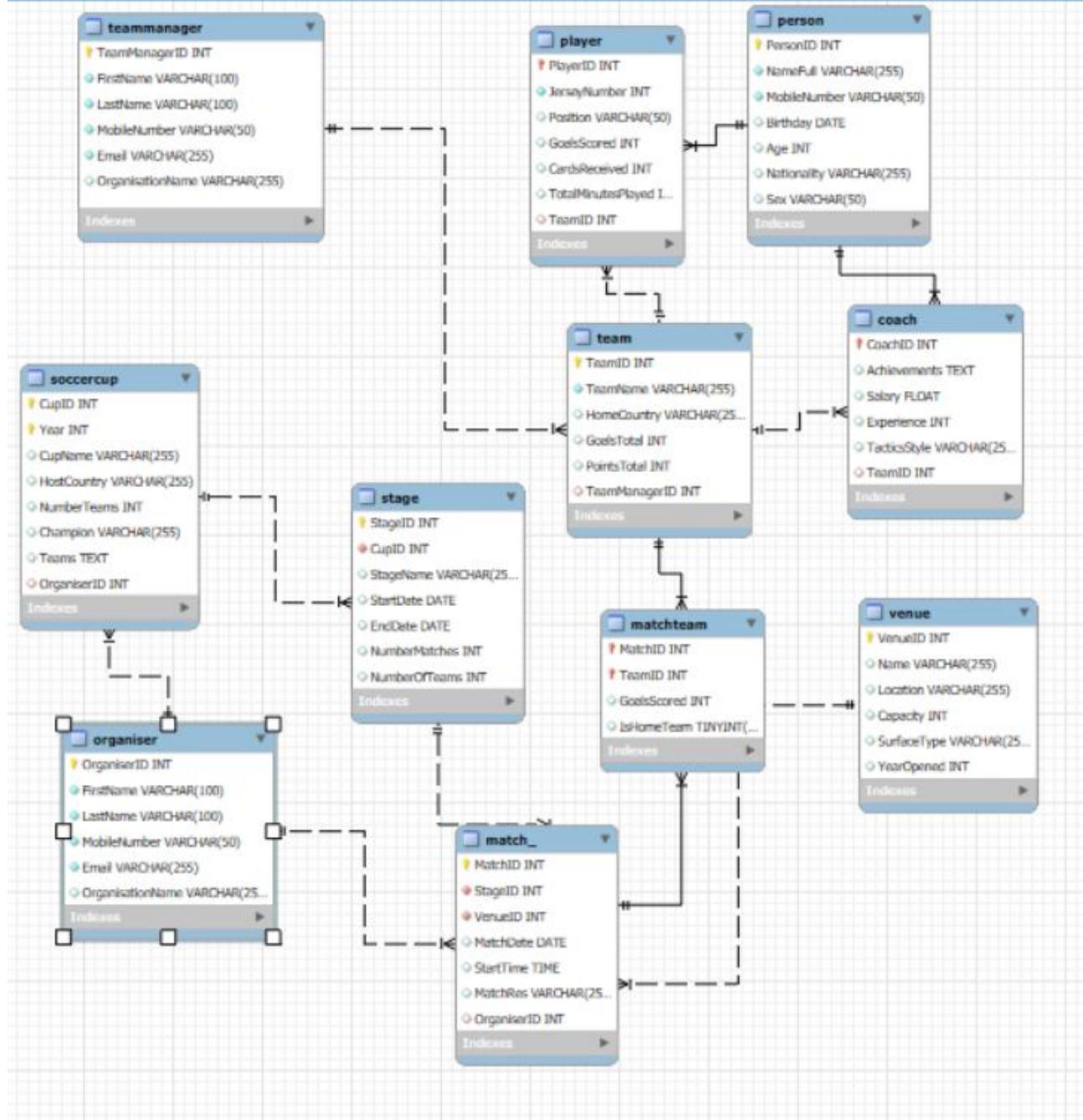
```

```

213
214 ALTER TABLE SoccerCup
215     ADD COLUMN OrganiserID INT COMMENT 'FK to Organiser table',
216     ADD CONSTRAINT fk_soccercup_organiser FOREIGN KEY (OrganiserID)
217         REFERENCES Organiser(OrganiserID)
218         ON DELETE SET NULL
219         ON UPDATE CASCADE;
220
221
222 ALTER TABLE Match_
223     ADD COLUMN OrganiserID INT COMMENT 'FK to Organiser table for match management',
224     ADD CONSTRAINT fk_match_organiser FOREIGN KEY (OrganiserID)
225         REFERENCES Organiser(OrganiserID)
226         ON DELETE SET NULL
227         ON UPDATE CASCADE;
228
229 ALTER TABLE Team
230     ADD COLUMN TeamManagerID INT COMMENT 'FK to Team Manager table',
231     ADD CONSTRAINT fk_team_manager FOREIGN KEY (TeamManagerID)
232         REFERENCES TeamManager(TeamManagerID)
233         ON DELETE SET NULL
234         ON UPDATE CASCADE;
235

```

The refined HW2 model represented as logical model based on modifications above:



### Conclusion:

In this assignment, I designed and refined a **Database System for the Soccer Cup domain**, building upon the work done in Homeworks 1 and 2. The objective was to automate and manage the core administrative aspects of a soccer tournament.

Throughout the development process, I completed the following steps: introduction, 1-5.

- Defined the mission and objectives of the Soccer Cup DBS, identifying which recurring processes need automation and clarifying how the system improves operational efficiency.
- Identified in-scope stakeholders (the Organizer and Team Manager) and described their interactions with the system in both narrative and tabular formats.

- Specified mission objectives and tasks at the operation level, including their inputs, outputs, and expected impact.
- Modeled the external views of the system from the perspectives of the two primary stakeholders.
- Extended the conceptual model by introducing two new entity types (Organiser, TeamManager) and defining their relationships with core data entities (SoccerCup, Match\_, and Team).
- Implemented the refined conceptual model as a logical schema in SQL, ensuring referential integrity, normalization, and support for future scalability.

Unfortunately, I havent done the next steps 6-9.

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References:

Homework 3.pdf

Microsoft Word - HW3 Grading Penalties by Steps.docx

[1] OpenAI. (2025). ChatGPT [Large language model]. <https://chatgpt.com>

ChatGPT

Annexes:

### Soccer Cup Tournament Workflow

The Soccer Cup DBS supports the administrative management of football tournaments, from initial setup to match result tracking. The process is divided into two main phases: **Pre-Tournament** and **Tournament Execution**.

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## 1 Pre-Tournament – Cup Setup & Team Registration

### Create & Configure New Tournament

- A Tournament Organizer uses the DBS to define the name, year, and host country of the tournament.
- The system creates a unique CupID and stores basic configuration.
- This step lays the foundation for team registration and scheduling.

### Register Participating Teams

- Each team is represented by a Team Manager who submits team information (name, home country).
  - The DBS creates a Team record linked to the current tournament via CupID.
  - The system ensures that only properly registered teams can be scheduled for matches.
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## 2 Tournament Phase – Match Scheduling & Results

### Schedule Matches Between Teams

- The Tournament Organizer selects two registered teams, a date, and a time.
- The DBS creates a Match\_ record that includes the match date, participating teams, and venue (optional if simplified).
- Matches can be organized into group stages or elimination rounds, depending on the tournament format.

### Record Match Results

- After each match is played, the Organizer enters the final score into the system using the match's unique ID.
- The DBS updates the match record with the final score and match status (e.g., "Finished").
- These records form the basis for determining standings or progression (in potential future system expansions).

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### Out-of-Scope Processes (Not Handled by DBS)

While the DBS handles core tournament administration, the following areas are out of scope:

- **Player or Coach Registration** – Individual participant tracking is excluded from the current system scope.
- **Venue Management** – Though matches reference venues, the system does not control venue data.
- **Fan & Media Interaction** – Ticketing, broadcasting, and sponsor visibility are managed externally.
- **Player Statistics** – Advanced features like individual performance tracking are left for future development.