1. Analyze the requirements of the organization

Organization: Professional Football Consulting Company

1. Record information of professional football players.
2. Demographic information: Player ID, Name, Date of Birth, and Nationality.
3. Anthropometric measurements: Height and Weight.
4. Club & transfer information: Club, Loaned From, Wage, Value, Release Clause, Contract Valid Until, Team Number.
5. Technical data: Overall, Potential, Position, Positional Rating, Preferred Foot, Weak Foot Rating, Skill Moves Rating, Tag, Pace, Shooting, Passing, Dribbling, Defending, Physic, GK Diving, GK Handling, GK Kicking, GK reflexes, GK Speed, GK Positioning.
6. Record information of professional football clubs: Club and League.
7. Maintain historical data.
8. Maintain the database.
9. Add a player.
10. Update a player.
11. Delete a player.
12. Add a club.
13. Update a club.
14. Delete a club.
15. Analyze the information of players and clubs.
16. Analyze the players in terms of demographic information, anthropometric measurements, club & transfer information, and technical data.
17. Analyze the clubs in terms of squad rating, squad value, squad wage.
18. Provide career strategies for players.
19. Provide operational strategies for clubs.

1. Identify the relevant entities, attributes and relationships together with any constraints and properties

Unnormalized:

1. Entities:

i. player: Information of professional football players.

ii. club: Information of professional football clubs.

iii. league: Information of professional football leagues.

iv. country\_region: Information of countries.

1. Attributes:

i. player (player\_id, season, player\_name, date\_of\_birth, nationality, height, weight, club\_id, loaned\_from, wage, value, release\_clause, contract\_valid\_until, team\_number, overall, potential, position, positional rating, preferred foot, weak foot rating, skill\_moves\_rating, tag)

ii. club (club\_id, season, club\_name, league)

iii. league (league\_id, season, league\_name, tier, country\_region)

iv. country\_region (country\_region\_name)

1. Relationships:

i. player\_club (player\_id, club\_id, season, joind\_time): The relationship between a player and the club he played for in a given season.

ii. player\_loan\_from (player\_id, club\_id, season): The relationship between a player and the club he belonged to in a given season.

iii. club\_league (club\_id, season, league\_id): The relationship between a club and the league it belongs to in a given season.

iv. league\_country\_region (league\_id, country\_region\_name): The relationship between a league and its country/region.

v. player\_country\_region (player\_id, season, country\_region\_name): The relationship between a player and his country/region in a given season.

Normalized:

1. Entities:

i. player: Information of professional football players.

ii. player\_dob: Players’ date of birth.

iii. club: Information of professional football clubs.

iv. league: Information of professional football leagues.

v. country\_region: Information of countries.

vi. general\_player: Subclass of Player. Containing information of non-goalkeeper players.

vii. goalkeeper : Subclass of Player. Containing information of goalkeeper players.

viii. position: Information of positions on the pitch. E.g. ST, CAM, GK.

ix. tag: Technical characteristics of players. E.g. Speedster, Dribbler, Distance Shooter.

1. Attributes:

i. player (player\_id, season, player\_name, nationality, height, weight, club\_id, loaned\_from, wage, value, release\_clause, contract\_valid\_until, team\_number, overall, potential, preferred foot, weak foot rating, skill\_moves\_rating, tag)

ii. player\_dob (player\_id, date\_of\_birth)

iii. club (club\_id, season, club\_name, league)

iv. league (league\_id, season, league\_name, tier, country\_region)

v. country\_region (country\_region\_name)

vi. general\_player : player (pace, shooting, passing, dribbling, defending, physic)

vii. goalkeeper : player (gk\_diving, gk\_handling, gk\_kicking, gk\_reflexes, gk\_speed, gk\_positioning)

viii. position (position\_name)

ix. tag (tag\_name)

1. Relationships:

i. player\_club (player\_id, club\_id, season, joind\_time): The relationship between a player and the club he played for in a given season.

ii. player\_loan\_from (player\_id, club\_id, season): The relationship between a player and the club he belonged to in a given season.

iii. club\_league (club\_id, season, league\_id): The relationship between a club and the league it belongs to in a given season.

iv. league\_country\_region (league\_id, country\_region\_name): The relationship between a league and its country/region.

v. player\_country\_region (player\_id, season, country\_region\_name): The relationship between a player and his country/region in a given season.

vi. player\_best\_position (player\_id, season, position\_name): The relationship between a player and his best positions in a given season.

vi. player\_positional\_rating (player\_id, season, position\_name, rating): The ratings of a player in different positions.

viii. player\_tag (player\_id, season, tag\_name): Tags of players.

ix. player\_dob\_info (player\_id, season)

Constraints, assumptions, and properties:

1. In a single season, a player must be either goalkeeper or non-goalkeeper (general player).
2. In a single season, a player plays for at most one club. (Although in reality, a player can play for multiple clubs in a single season by transferring and/or loaning, we record only the club to which a player belongs at the beginning of each season. In other words, we update the database once a year.)
3. In a single season, a player may be loaned from at most one club. In other words, a player can belong to at most one club. If a player is not loaned, he belongs to the club he plays for.
4. In a single season, a club belongs to at most one league.
5. A league always belongs to a certain country/region.
6. In a single season, a player can belong to at most one country/region.
7. According to FIFA’s regulations, a player can represent at most one country/region at any given time. Although some players may have double nationalities, they can only register one at FIFA. However, they may change their nationality if they fulfill the requirements. Hence, a player may have different nationalities in different seasons.
8. A player’s name may change.
9. A player may have multiple (at least one) best positions.
10. In a single season, a player has exactly one rating for one position.
11. In a single season, a player may have multiple (including zero) tags.
12. A player’s overall should be dependent on other attributes. However, this functional dependency is not made public by EA Sports. Therefore, we just treat overall as independent of other attributes.
13. A league’s name and tier may change over time. E.g. English Championship changed from tier 1 to tier 2.
14. A player’s potential must be greater than or equal to his overall in a single season.
15. A player’s preferred foot must be either left or right in a single season.
16. A player’s weak foot rating and skill move rating range from 1 to 5.
17. A player’s team number ranges from 0 to 99.
18. In a certain season, a player’s contract end year must be greater than the season’s end year. E.g. Contract Valid Until = 2023, Season = 20.
19. A player’s ratings (overall, pace, shooting, passing dribbling, defending, physic, gk\_diving, gk\_handling, gk\_kicking, gk\_reflexes, gk\_speed, gk\_positioning, and all positional ratings) range from 1 to 99.
20. Players’ height is in centimeters while weight is in kilograms. Wage, value, and release clause are in euros.