CONCEPTUAL MODELING

1. FORMULA 1

It is intended to store information about a season of Formula 1 Championship.

For each tag participant in the season it is intended to store its name, country of origin, current number of championship points and which cars entered. For each car, the weight, the power and the maximum speed are stored.

For participating pilots we need to know his name, address, age, nationality and current number of points in the drivers ' Championship. A pilot can only drive a car throughout the season, although a given car can be driven by more than a pilot. This situation, although not very frequent, can arise, for example, due to the absence of a pilot injured in an accident.

A number of races are held on circuits and dates set at the beginning of the season. For a given race it is possible, throughout the season and for varying reasons, to change the circuit where this takes place. In exceptional situations this can also happen by conducting two races on the same circuit. For each circuit, the name, location, country, number of laps and perimeter are stored.

With regard to the realization of a race matter to know for each pilot that has participated; (1) the position on the starting grid; and (2) the position in the final ranking. Regarding race matters also know what are the riders who dropped out, in which lap has occurred and what the reason for the abandon. [Based in an exercise by exercise by António Brito]

2. GARDENER

A gardener is in charge of the maintenance of the gardens of their clients. Thus, he wants to know about each client his name, NIF, address and location. These data are needed for billing purposes.

About each garden it is necessary to know the name, address, location, area (in hectares), the customer responsible for this garden and whether he owns the garden or just explore it. Still about each garden is necessary to know the types of plants that are found there, area occupied by each of these plant types and number of plants of each type. About the types of plant, the name by which is known (for example: orange blossom) and its scientific name (e.g. citrus sinensis) is stored.

For each type of plant it still matters to know the pests that affect it (e.g. the orange trees can have cochineal). For each pest, its name and seasons (one or more) in

which treatments must be performed are stored. Seasons are characterised by a start date and an end date. [Based in an exercise by by João Mendes Moreira]

3. MUITOSJUROS BANK

Build a conceptual model to represent the reality of the MuitosJuros Bank, taking into account that:

    i.   customers have a title, name, address, zip code, location, and phone;

    ii.   the accounts are linked to an account number, an account type and the current balance;

    iii.   can be carried out movements of various kinds and amounts;

    iv.   each movement must be associated with a date;

    v.   each account can have one or more holders with different order (e.g. 1st and 2nd holder);

    vi.   interested in what are the first holders of a given account, the dates on which an account had movements and who are customers who have an account of a given type. [Exercise by Carla Teixeira Lopes]

4. EMPLOYMENT AGENCY

An employment agency aims to find suitable personnel to fill vacancies provided by companies. Thus, when a company wants to recruit people, it must provide the Agency with a work area, a description of that work, qualifications and skills required, base compensation and an indication of the applicant company. About the company it is necessary to know the name, address and phone.

When a person uses the agency to seek employment he/she has to provide the name, date of birth, marital status, qualifications, skills, minimum remuneration and a list of the work areas ordered according to the preference of the person. Qualifications, skills and work areas set both by companies and by people are selected from a list defined by the Agency.

The computer system will automatically assign jobseekers to offers made by companies. Thus, for each offer, three people are assigned, who are contacted to attend individual interviews. The system must record the date of contact, as well as the date and time of the interview. In the case of the person who has been selected for more than one job offer, he/she only goes to one interview. In the interviews a rating is assigned for each of the jobs to which that person has been assigned. [Based in an exercise by João Mendes Moreira]

6. REPAIR SHOP

A car dealer plans to computerize its repairs service. Of each client, the name, address and phone number are saved as well as the license number, the brand and model of each car, as well as who is the client owner of this car. On employees of the workshop, the name, the address, the telephone, the specialty of this employee and the cost per hour are stored. It is known that the time cost of the workforce depends on the specialty (for example: the electricians have a price, the plate-worker another price, etc.).

The shop keeps the register of all pieces in stock. For each piece is known: the code, the description, the unit cost and the amount available. It is still necessary to know which car models are compatible with each piece.

For each repair performed is stored the vehicle information, the client (default is the owner of the vehicle, but may be someone else), the start and end dates of the repair, and still: (1) all the pieces used in the repair (obviously, only compatible pieces with the model of the automobile in repair can be used) and its quantity; and (2) the number of hours worked by each employee in the repair. [Based in an exercise by João Mendes Moreira]

7. SOCCER LEAGUE

The entity responsible for major football championships of a seaside country aims to computerize their services. To this end, it asked for help from students of FEUP-MIEIC.

In this entity, designated by the League, clubs are inscribed. Each club has several teams and each team participates in a tournament in each season. A Club may have a team for each distinct age class (juveniles, juniors, etc.) and by gender (male or female). Likewise there is, per season, a Championship by age group and by gender. Teams can only participate in the League of the same age group and gender.

On each team it is necessary to know the players. Each season has two periods for the registration of players. In every moment it must be possible to know which players legally registered in the League and what the Club to which each is bound. At one point a player can only be bound to a club. The team to which the player belongs is determined at the beginning of the season for their age group and by its gender.

At the beginning of the season is set a calendar of games for each Championship. Each game shall include: the journey to which it relates, expected date of completion, the teams in confrontation (visited and visitor) and the stadium where the game takes place and which is, by default, the stadium of the Club visited, but may, for some reason, be another. The date of the game can be modified by request of the League clubs.

About the games it is necessary to keep information about the different events that occur throughout the game. These events are established (e.g., yellow/red card, goal, substitution, etc.). Obviously about: disciplinary cards, it is necessary to know who was shown; about the goals, who scored and in favour of the team (are there own goals!); and about the replacements, who went in and who's out. There may be other types of events for which it is only necessary to know the player involved. Is relevant to all events, the minute of the game it happened.

For each class set the appropriate attributes. For example: the clubs have name, address, year of Foundation, etc.[Based in an exercise by João Mendes Moreira]

8. MEDICAL CLINIC

A medical clinic has at its service a set of doctors and serves a set of patients. Both are people, described by name, TAX ID, address, postcode, telephone number and birthdate. In the context of the clinic, they are identified by a code. Doctors have a specialty and patients a profession.

The work of the clinic is organised according to a schedule that notes what days each doctor gives consultations (e.g., Mondays, Tuesdays, …), the start time of the job and how many patients he/she will see. Patients mark consultancy to a day in which the intended doctor is available giving also the consultancy start time. About each consultancy it is also stored the price paid, the patient status (rating of 1 to 5) and the report query.

It is intended to also keep the prescriptions of medicines made by doctors to patients. For medicines, the name, the laboratory, the method of administration, the amount of drugs on the packaging and the amount of packaging prescribed are stored. [Based in an exercise by Gabriel David]

9. BRISA

The company BRISA wants to keep the information on the use of its motorways according to:

i. the existing highways from the A1 (North) to the A8 (Loures);
ii. tolls are charged on the barriers, which have a distinguishing number and are deployed in a site;
iii. the value of the toll depends on the class of the vehicle (from 1 to 4) and is addictive (Porto->Coimbra = Porto->Aveiro + Aveiro -> Coimbra) and symmetrical;
iv. we want to know what day and time the toll was paid, the route to which it relates and the registration and the mark of the respective vehicle.

v.   some vehicles are green vehicles, i.e., have a device of automatic identification and it is necessary to know the account number, Bank and agency responsible for the respective payments.

NOTE: it must be possible to represent the costs of the routes independently that someone has already paid that toll. [Based in an exercise by Gabriel David and Ana Paiva]

10.   RED BULL AIR RACE

We want to store information about one season of the Red Bull Air Race competition. Pilots participate in this competition and are organized into teams. Each pilot competes throughout the season with a single aircraft model.

Each pilot is identified by a number and it is intended to store his or her first and last name, as well as their nationality and date of birth. For a team, you only need to know their name and country of origin. However, each airplane model is characterized by its power, maximum speed length, width and weight.

Throughout the season, drivers compete in races that take place in a given city in a given year. It is interesting to know in which country and on which date each race took place as well as the number of pylons in the race and how many drivers were eliminated in the first round.

The races follow a 'two-stage model'. The first phase consists of running the course in the shortest time possible, fighting only against the clock. This phase is divided into stages: Free Practice, Qualifying, and Elimination. For each stage it is interesting to save the time, the relative position of each driver as well as the penalty seconds. The times obtained in the Free Practice phase dictate the order of departure for Qualifying, and the order of departure for Elimination. The driver with the worst time in Qualifying does not go to Elimination and the four worst in Elimination do not go to Stage Two.

The Second Stage is a Duel stage in which the drivers compete directly 2-on-2 from the Quarter Finals to the Final. It is important to keep track of who competed in which duel, in which stage, with what time and with what penalty.

The scoring system is linear, awarding 6 points to the winner up to 1 point to the 6th classified. [Based in an exercise by Gabriel David, Vasco Vinhas and André Restivo]

12.   FACULTY DEPARTMENT

A department in the Faculty wants to implement an Information System to record student enrollments and grades. In the department there is more than one course and each course is composed of several curricular units. A curricular unit can be common to several courses. It is important to know the name of the courses and for the curricular units, the name, year, semester and number of weekly hours. For students, it is necessary to know their name, address and telephone number. A student may only be enrolled in one course, but may enroll in a maximum of six courses at any one time. maximum number of six curricular units, with priority given to curricular units in the earlier years.

As far as evaluation is concerned, the system used consists of several models. Each model, which is known by a designation, comprehends several phases. A phase is a set of evaluations whose weighted average leads to a final grade that, being higher than the established minimum grade (not necessarily 10) , leads to approval in the curricular unit. For each phase it is necessary to know its name, the minimum passing grade and for each assessment (1st frequency, 2nd frequency, practical work, etc.) the respective weight for calculating the final average.

There are several evaluation models available for the different courses, but each curricular unit can only have one evaluation model associated with it. However, in certain situations, a student (military, association leader, etc.) may have, in a given subject, an evaluation model different from the one associated to that curricular unit. The system should also record all the marks obtained by students in the various assessments in order to automatically calculate the final average for each phase and the final average for each phase. automatically calculate the final average for each phase and determine whether or not the student has passed the curricular unit. [Based in an exercise by João Mendes Moreira]

13. MEGA SHOPPING MALL

The managers of a mega shopping mall (MsC) want to keep the following information about its structure, products, employees and customers.

MsC is divided into several departments, each of which is identified by name and location. Each department has a director in charge. The directors are MsC employees, and as such have a date when they are evaluated for possible promotion. A director may be responsible for more than one department.

Each employee is identified by name, has a social security number, a salary salary, and can request one or more days of vacation. Each vacation period is identified by a combination of the start and end date. During each of these periods there may be any number of employees on vacation or there may be or it may be that no one is on vacation.

The MsC has an evaluation procedure in which the directors evaluate each other. Each director is evaluated by another director and can evaluate more than one than one principal. From each evaluation results a rating that must be maintained along with the date the evaluation was conducted.

Each department has assistants, who are also female employees. Each assistant works in one department. Each department sells one or more products. Each product, on sale in one or more departments, is identified by its code and has a name and a price.

Some directors place orders for products. A product is ordered by a director for only one department. A female director orders any number of products for one department. A product is ordered by only one director for one department. For each product the date and quantity are recorded. [Based in an exercise by João Mendes Moreira]

14. RESERVED ACCESS RESTAURANT

The manager of a restaurant, with access reserved for members, wants to implement an information system. The use of the restaurant is reserved members, who are identified by their member number and whose name, address, phone their name, address, phone number and date of admission. Members can bring guests to the restaurant and there is no interest in keeping information about them.

The restaurant has a set of tables, each with a certain number of seats, however, some tables (not all) can be grouped two by two (a table can have more than one (a table can have more than one table to which it can be associated) in order to increase the number of seats available. increase the number of seats available. In this case the number of seats in the is equal to the sum of the seats of the two tables minus one. Members can make table reservations, indicating the date and time desired. to the number of reservations that each member can have at any given time. Depending on the number of people invited, a member's reservation may correspond to several simple tables or associated tables in sets of two.

The restaurant has several employees, each assigned to a set of tables. one table may, however, have several employees in charge of serving it. serving. The menu is divided into several groups of items (drinks, meat, etc.) and for each item there is a description and price.

Each meal is associated with a date, time, a set of simple or associated tables, the number of people per table or associated tables, the waiter responsible for each simple or associated table, and a member responsible for the meal. Each participant in the meal may order more than one unit of the same item. Orders placed by customers must be stored in such a way that it is possible to obtain the detailed expense of the meal by a responsible partner, by table, or by any guest or set of guests at the same table or at separate tables participating in the same meal. The participants of a meal are identified at each table by a sequential number. [Based in an exercise by João Mendes Moreira]

15. TOURIST ATTRACTIONS

A tourist guide wants to implement an information system to keep track of the main attractions in Portugal. For each tourist attraction it is important to know its name, type (whether, for example, it is a museum, a monument or a beach), address, telephone number, fax number and email address. In addition, each tourist attraction is given a rating from one to five and the expected duration of a visit to it. The price of an admission ticket depends on the type of visitor, for example there are tourist attractions with special prices for students and the elderly. The opening and closing time of a tourist attraction can depend on the time of year, a time of year being characterized by a designation, start date and end date.

Tourist attractions should be grouped by locations. A site, characterized by a name and a description, could, for example, correspond to a city or a town. An example of a location might be Conímbriga, where you can visit two different tourist attractions, the ruins and the museum. For each location it is important to have a record of the main hotels and restaurants in the area, and their respective capacities (to know if they have capacity for large groups or not). For hotels it is also important to know the number of stars and for restaurants the average price of a full meal. In addition, it is necessary to keep a register with the typical dishes of each place, characterized by a name and a description. Note that the same typical dish can be characteristic of more than one location.

It is also important to keep a list of the most significant events. For an event it is necessary to know its name, the start and end date (if it is a one-day event the end date will be blank) and the places where it is celebrated. It is also necessary to keep a description of the particularities of a given event in a given location, for example, New Year's Eve in Madeira is known for its fireworks.

The tour guide would also like to be able to define routes that include visits to various tourist attractions. For each route it will be necessary to keep its name, a description, the planned overall duration and the recommended means of transport. It is also necessary to know the order in which the visits to the different tourist attractions included in a route are planned. [Based in an exercise by João Mendes Moreira]

17. MODEL AGENCY

CiMiSmile Model Agency intends to implement a database to manage all information about its employees and the work they do. The agency's employees are divided into models, photographers and agents.

From the employees the agency wants to know the name, address, contact, and tax number. Models also need to know their gender, nationality, height and a set of three measurements. The models can be represented by one of the agents, but can also have an independent activity. Each model also has a portfolio with the most important works of his or her career. Each page of the portfolio consists of a brief description of the work, the date and place where it was taken, and a set of photographs (a maximum of three) along with the identification of the photographer who took them. In case the photographer is not one of the agency's collaborators, it is only necessary to know his/her name and contact details.

Agents are employees of the agency whose job it is to monitor the work of the models they represent and look after their interests. It is important to know the year in which each agent started working for the agency. In order to maintain a history of each agent's activity, it is necessary to keep the dates on which they started and ended their work with each of the models they have represented since they started at the agency. It is important to know the reason why you stopped representing a particular model.

Knowing that models and photographers have their personal preferences, the agency wants to know which are the five favorite photographers of each model and also which are the five favorite models of each photographer. The preferences of each should be in ascending order.

The agency carries out jobs of various types (photo shoots, fashion shows, advertising). Each job may involve several models and several photographers. For planning purposes, it is necessary to save the day, the start time and the duration of the job. It is also important to know the location where it will take place. The agency also wants to know who the photographers were that worked with each of the models involved in the job. [Based in an exercise by João Mendes Moreira]

18. TENNIS TOURNAMENT

Imagine that you belong to the management of a tennis club like Wimbledon and that the need to implement an information system with the objective of facilitating management of the results of the tennis tournaments held there.

Knowing that a tennis match is composed of Sets, and that each Set is formed by a set of games by a set of games, we want to know the result and duration of each Set referring to a given match. For each Set of a given match we want to store the result of each of its games.

For a given match, it is also important to know its date of realization, in which Court it took place, who was the referee, who were the line judges and what were their respective positions (back line, service line, etc.). We also want to know the name and age of each player, umpire and line judge, as well as the ATP ranking of each player. Regarding the Courts, it is of interest to know the maximum capacity of each one. [Based in an exercise by João Mendes Moreira]