

# Informatics 1B. Tutorial 1

## Data and Analysis: Entity-Relationship Models

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### 1 Introduction

The Royal Guipuzcoana Company was a Spanish organisation that existed in the XVIII century. During this period most South American countries were Spanish colonies. This company was supposedly created to fight smuggling of people and goods between Spain and South America. However, it proved to be one of the most corrupt organisations in that historical period. It started its operations in 1730 and went out of business in 1784. The Guipuzcoana had a large number of ships it used for trading. Some were generally used for transporting gold, leather and food, others for trading slaves, etc. The most important types of ship owned by the Guipuzcoana were *Fragatas*, *Navíos*, *Balandras* and *Goletas* (Names are in Spanish as appropriate translations in English were not found for most of them). The first two types were very wide vessels, with huge load capacity. The last two were narrower, with less capacity but much faster - they were mostly used to smuggle slaves and jewels. For each vessel, the company kept a record of its name, the date it was acquired and its capacity.

Due to the available naval technology at the time, and the conditions of the Atlantic Ocean, routes were constrained to a large extent. Winds and currents would make it very difficult to attempt most of the shorter ones. The environmental conditions favoured one kind of route for going to South America and one for coming back to Europe. These will be referred to as *typical* routes. In some cases, for some kinds of ship, or depending on the load the ship was carrying, *atypical* routes were also possible.

Fragatas and Navíos could only do *typical* journeys whereas Balandras and Goletas could do the typical journeys but could also do some *atypical* ones, following different routes that could take them through the west coast of Africa (on the way to South America) and through Cuba, the US and other places before reaching their destination in Europe. Journeys in general were also classified as *outgoing* when they went to South America or *return* when they were coming back to Spain. For each journey the captain had to write a number of details in its log stating the name of the ship, its type, the planned route, origin, destination, the dates of departure and arrival (for outgoing and return journeys) as well as the purpose of the trip.

Finally, there were a number of Guipuzcoana's employees who had special supervisory/managerial roles for each journey, as follows:

- *Capitán General (CG)* Each journey required that *at least one* CG was present as a general manager. It was the CG's duty to keep a detailed log of the journey and make decisions concerned with changes in route plans, dealing with major weather problems and so on.
- *Jefe de cocina (Chef)* At least three Chefs had to be part of a single journey. The Guipuzcoana captains did not like the idea of being left in the middle of Atlantic without access to decent food.
- *Técnicos Mayores (Technicians)* At least three Technicians were allocated for each journey as a preventive measure against any ship malfunction.
- *Marineros (Sailors)* Depending on the size of the vessel and duration of the journey a varying number of sailors were hired. These numbers would normally be between 15 and 30.

In the available journey's logs there is information about CGs, Chefs and Technicians, as it was required by the company that this information was added to the log. However, there is no information available about sailors, except for the number of them present in a given journey. From these logs we know the following: Andrés Osorio, Julio Echeverri, Fernando Bermúdez and Pedro Suárez were CGs. Simón Vázquez, Alejandro Benavides, Iker Cristóbal, Amador Bendayán and Enrique Lorna were Chefs and Luis Pérez, Rafael Cana, Lope Espina, Juan Mendoza, Kader Petri, Lucio Perdomo, Cristo Anez and Franco Vallenilla were technicians.

## 2 The Guipuzcoana Database Requirements

We are interested in designing a database to store relational data about the activity of the Guipuzcoana company. Your task is to complete the design an E-R model which captures the elements required in the database such that it is possible to retrieve, for example, the following information:

- Properties for a given vessel, including its type, name, acquisition date and capacity
- All vessels for a given type *e.g* Fragata, Balandra, etc
- All the journeys for a given vessel, or type of vessel
- All atypical journeys departing from Europe or South America
- All journeys that took place between, for example, 1734 and 1744
- All journeys that took more than 6 months to come back to their departure place

## 2.1 Question 1

Start by reading the introduction carefully, trying to extract as much structured information as you can from the text. Make your own notes about what data you believe is relevant and available and discard whatever information which you find to be incomplete, vague or irrelevant. After this initial extraction you should have a good idea about the information we are interested in keeping about the Guipuzcoana Company.

Your next task will be to work with the *entities* shown in the appendix you should have downloaded with this handout. What are the attributes for each entity? Add their names next to the entity box, draw an oval around them as shown in the lecture. Determine the *primary key* for each entity and underline their names. Remember that the primary key will uniquely identify each instance of a given entity. For example, the entity *vessel* can have the attribute name as its primary key as names for ships are unique.

(HINT: can we say the same about people's names? will you have to include a new identifier for the *people* entity?)

## 2.2 Question 2

What relationships can you logically determine to exist between these entities? What is the nature of each of them *1-to-1?*, *1-to-many?* *many-to-many?* Try to name each of the relationships you find.

(HINT: when naming relationships, think bidirectionally!)

## 2.3 Question 3

For each relationship you established in the previous question, how does it affect your model?

(HINT: think about how the entities on both sides of a relationship you found are affected by the *type* of relationship that exists between them. What does each entity need to know about the other in each case?)