

- However, beyond the huge amount of data to be generated, it is important to understand that these have different formats, making the analysis process much more complex and intensive for those who use these data. Furthermore, all cities have their mode of operation, i.e., no city is similar and therefore the needs tend to be specific and objective when making decisions;

The Portuguese capital city, Lisbon, is the case study of this article. It has about 500,000 inhabitants, which explains why requests for help during an emergency tend to be rather critical. The Lisbon Professional Fire Brigade Regiment (FBR) is the focus entity of this article. It is responsible for the safety of people and goods in the city through rescue actions, prevention, and civil protection support.

The article's objective is to help solve a challenge suggested by LxDataLab, a Management and Urban Intelligence Centre of Lisbon. This challenge focus on:

- Historical homologous periods of the occurrences of the FBR and other entities, characteristics, state and causes of the occurrences and degree of risk, among others;
- Three main focuses: a temporal analysis, an understanding of the occurrences' characteristics and finally the mode of intervention and the current state of the occurrences;
- A Big Data problem, in the sense of transforming this high amount of data into a highly effective and efficient process for the FBR when decision-making is necessary, specifically in an emergency intervention request;
- Solve the problem and answer the question "How to improve FBR intervention requests when an emergency is detected?";
- Developing a functional prototype containing interactive dashboards allowing the analysis of city-state indicators and the identification of variables that may be associated with intervention requests to anticipate these scenarios;

The data were analysed in the "[Talend Data Quality](#)" tool to understand the data provided, and their quality and get some conclusions. After that, the data provided in 3 spreadsheets (.xls) was properly organised in a data warehouse to reach a result. The data warehouse structure consisted of a table of facts and eleven dimensions, which were placed in a [SQL](#) database using the workbench management tool. The transformations that some attributes had to undergo were performed through [MYSQL](#) commands. The result was illustrated with dashboards using the data visualization tool, [Tableau](#).

The article is structured into seven chapters. The first chapter addresses the objective of the case study and its relevance. The second chapter refers to the background, explaining the basic concepts present in the practical development of the article and the kind of work already

done regarding the subject. Three previous works were studied. The third chapter presents the materials and methods used for the execution of the article as well as the data model and tools used. The fourth chapter shows the results of the case study. The fifth chapter presents the discussions, an analysis of the main results obtained, as well as measures to act on these events. In the sixth chapter, one can read the conclusions of the development of the prototype and in the seventh chapter the bibliographical references used for the development of the article.

2. Background

Today, there is a variety of new challenges in our cities, created by technological advances and urban development. These challenges lead to the Smart City concept. For Anthopoulos [4] a Smart City is defined as an innovative city that uses information and communication technologies and other means to improve the quality of life, the efficiency of operations and urban services. However, managing a Smart City is not an easy process. Making a good decision at a critical moment can lead to a more efficient operation, a more profitable city, or perhaps more satisfied citizens. This is how the concept of Business Intelligence (BI) emerges. At the moment, BI is understood as a set of data that has been collected from the past and the present to make better decisions about the future. This data is selected through certain criteria to draw conclusions. Business Intelligence makes the whole process of decision-making more intelligent, clearer, and as likely to be the future [5].

Equally important, the concept of Data Science emerges, and this concept came from the accelerated growth in government and trade data creation [6]. According to Cady [7] the concept is explained through complex algorithms and analysis that organise the data, being possible to obtain forecasts, to help in decision-making with greater accuracy, speed and efficiency, concrete hypotheses are obtained, being also possible the anticipation of future scenarios.

However, managing and analysing data always offer great benefits to organisations as it is understood. However, as a result, they also imply other challenges. In this way, the concept of Big Data has expanded to explain a situation in which the logistics of storage, processing or data analysis have surpassed the traditional operational skills of organizations [8].

2.1. Smart-Cities (and type of occurrences)

The "Smart-City" concept has become extremely popular and consists of the use of a plethora of IT innovations to make cities smarter for the citizens. This concept first appeared in the 1990s and the main focus was on the impact of new Information and Communication Technologies on modern infrastructures within cities.

