

ASPECTS REGARDING DATA ACQUISITION AND ANALYSIS IN RESEARCH

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ABSTRACT: The foundation of any research is represented by data acquisition. Data analysis involves data preparation, analysis and interpretation. The purpose for which these data are collected is established, errors are then eliminated, statistical methods for data interpretation are then applied and finally the results obtained are actually the conclusions of the study. Data acquisition and analysis allow for the correct extraction of information. Often, the data collected are heterogeneous, and, in order to reach a final set of high-quality data, data processing is necessary, in order to analyze them and obtain valid conclusions. The paper presents the role of data acquisition and processing and also presents the various fields of application. The paper concludes with proposals for future research directions.

KEY WORDS: data management, research, data acquisition, data analysis

1. INTRODUCTION

Artificial intelligence, the decision-making system, is based by data acquisition and analysis [24].

Data acquisition involves collecting information for the purpose of its subsequent analysis. Data acquisition is useful for any field, having an essential role in research [1], [4], [8], [20].

Large amounts of data are collected and can be accessed globally. They are used by organizations to model businesses, present different cultures, types of communities, etc. [23].

Data management is represented by the collection and processing of data, as well as the efficient use of data, in order to obtain superior results [2], [11], [25]. Data acquisition and statistical interpretation can be applicable in any field. For example, data acquisition can be applied in fields such as scientific research, engineering, medicine, economics [5], [12].

Data acquisition and analysis is vital for economic development. In order for a company not only to survive in the economic market, but also to develop and prosper, it is necessary to analyze both the internal environment of the company and the external environment of the company [3], [5].

Investments in data acquisition and processing are also justified from an economic point of view, since the value of the results obtained as a result of research activity often exceeds the initial economic investment [8].

The complexity of data, as well as the large volume of data, has led companies to increasingly prioritize and solve this new challenge, which involves both data acquisition and especially their processing and interpretation. For data management, a strategy must be adopted that takes into account all elements, requiring a capacity for permanent adaptation, on the part of companies, to the continuous evolution of technologies used both in data acquisition and especially in their processing [6], [25].

2. DATA ACQUISITION AND FIELDS OF APPLICATION

The development of technologies is a determining factor for the development of other fields, such as the medical field. More efficient equipment contributes to greater accuracy of the data obtained. Thus, human error is reduced, and the results obtained

from data analysis are more precise [16].

In the medical field, the collection of data about patients is also carried out with the help of medical devices. This data, corroborated with the rest of the information about the medical condition of the patients, helps in diagnosing the patient [17], [22].

Smartwatch users, for example, can monitor their health with its help. The smartwatch collects information about the person's level of physical activity and about the pulse value during physical exercise. If it is worn constantly, even at night, it can record the value of the pulse and at rest, as well as the phases of sleep, highlighting the quality of sleep [7], [19], [21].

The development of technologies means the development of increasingly high-performance equipment, which ensures an increasingly high accuracy of the measured values, the results becoming increasingly precise. Measuring parameters using high-performance devices ensures a lower error rate, an important aspect in the field of research, since the conclusions will be unaltered [14], [16].

Radiology and medical imaging are based exclusively on medical equipment, which means that the development of technology determines the evolution of this medical specialty [13].

Healthcare organizations use large sets of patient data, in order to develop treatment

plans in order to improve the health of the population [9], [15].

Data acquisition is useful in the industrial field (for process control), in research and development (especially for the experimental field), in the environmental field (for monitoring environmental parameters), in the medical field, etc.

The volume of data obtained nowadays is large, and the data sets may also contain errors. Data quality is important, since decisions depend on the availability of considerable amounts of quality data [10], [18].

The quality of the collected data is very important in the decision-making process. The characteristics of high-quality data are: consistency, accuracy, completeness and timeliness [12].

Data must be stored, integrated and prepared to create a solid database [25].

Data can be found in several formats: structured, semi-structured and unstructured [12].

Technological solutions called data acquisition systems have been developed for data acquisition [25].

In order for data to be analyzed, data refinement is often necessary [25].

Data formats and characteristics of high-quality data are shown in Fig.1.

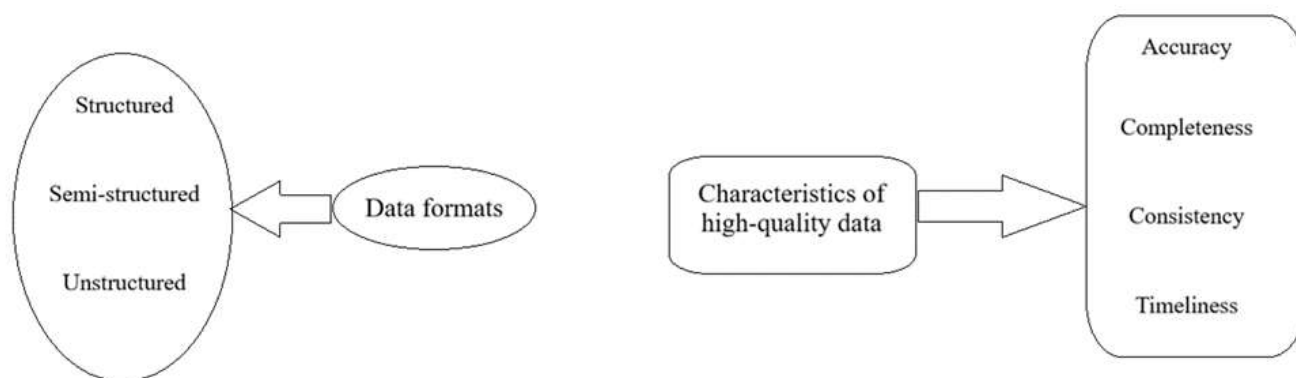


Figure 1. Data formats and characteristics of high-quality data

Source: The author's adaptations

Among the tools used in data analysis we mention: R programming language, Python programming language, Microsoft Excel program [26].

Data acquisition and processing are important in any field of research.

3. CONCLUSIONS

With the development of technologies, data acquisition and processing can be achieved much more easily.

After data collection, they are processed, then interpreted, reaching various conclusions. The benefit of data analysis in research is inestimable, since the statistical interpretation of data leads to certain conclusions, which can be revealing and can influence decisions in the scientific research field.

Data acquisition and processing is important in any field. In the economic field, the initial investment is often lower than the income achieved from data acquisition and analysis and their use. In the medical field, through data acquisition and analysis, a connection can be observed between the measured parameters and symptoms, which suggests the existence of certain pathologies.

An appropriate strategy for data management and processing is always necessary, which guarantees that valuable data are available, accurate and can be correctly processed and interpreted.

As future research topics, the author proposes to study data processing methods.

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