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Generation Of Knowledge Mechanism In Health Services Organizations As A Competitive Value

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ABSTRACT

Statistics have always been a very useful tool for the business world. Today, however, its value has increased due to innovations in data mining. To evaluate the role that this instrument plays in the generation of knowledge in organizations, several reflections derived from a bibliographic review focused on this purpose are presented below. The results allow students and professionals to have access to a consultation document with updated information extracted from recent research in the area.

Keywords: Statistics, Knowledge, Globalization, Innovation, Competitiveness.

1. INTRODUCTION

Statistics provide analysis tools applicable to any area where data is generated, thus, it is possible to predict or achieve a comprehensive representation of reality based on measurable facts, with some degree of confidence in a future event. Nowadays, the need to know this reality, with an acceptable margin of certainty, is a challenge for many leaders of organizations, who are continually faced with situations that require effective decision-making based on information, facts, reliable forecasts, also including the component of experience and self-assessment built by knowledge [1].

To achieve this scenario, there are today alternatives of deep and complex analysis that facilitate the obtaining of this type of statistical information, making specific reference to branches such as data mining, artificial intelligence, business intelligence and big data, all of them having something in common, beyond their characteristics, scope, and information structures: statistics and data as raw material to obtain answers to business problems [2, 3].

The research indicates that, in organizations, especially small and medium-sized ones, the implementation of this type of techniques is somewhat complex, which presents

limitations, whether due to economic resources, available human capital or lack of knowledge, but that it is a latent need that must be addressed in the short term [4]. By virtue of this, the professional in the administrative and managerial areas must have skills that allow him/her to master these processes that are already a trend and that in the medium and long term will be present in companies daily.

The objective of the following document is, therefore, to present some theoretical ideas on the relationship of the statistic and their most representative techniques with the analytical areas mentioned above, to briefly justify the importance, transversality, and impact of this discipline for decision-making in the organization. To this end, concepts, elements, techniques and foundations of the statistic and databases and their relationship with current trends in analysis will be considered.

2. METHODOLOGY

The proposed method is oriented towards documentary research, widely used in studies of this kind, since it allows for an exhaustive review of theoretical approaches, both contemporary and classical, to construct an integral vision of the different points of view on the subject [5].

To guarantee a rigorous methodological structure, documents such as scientific articles, reports and official publications of recent generation were analyzed in both Spanish and English. In this way, the main techniques of bibliographic research were applied to organize, analyze, and extract the information required to meet the objectives [6].

3. STATISTICS: CONCEPT AND GENERALITIES

Statistics is a branch of mathematics that aims to obtain information from the application of techniques and methods to a set of data representative of a population to make inferences about it or to determine its main characteristics [7]. Therefore, the raw material for working with statistics is the data obtained directly from the population to be analyzed, which must comply with a series of characteristics and structure to be useful.

In this sense, current trends in analysis, such as data mining, business intelligence, artificial intelligence, big data, or data analysis [8] use some of the most relevant statistical techniques to extract meaningful information, as well as to identify patterns, relationships, associations, predictive models, among others [9]. To better understand the interrelationship of statistics with these analytical areas, it is necessary to define in a very brief way, its two main branches, the descriptive and the inferential.

3.1 Descriptive and inferential statistics

The descriptive branch, widely used, is the one that allows to obtain information from the data set regarding the characteristics that represent it, its behavior, and main features [10],

on the other hand, the inferential statistics, is inductive, that is, from a set of observed data it tries to determine the properties of the generating distribution (population) [11]. This distinction is relevant for understanding the functioning and application of statistical techniques, according to the objective or problem to be solved, in other words, the deductive or inductive method will set the standard for establishing the type of analysis to be performed. Figure 1 shows a simplification based on the well-known Wallace wheel (1997).

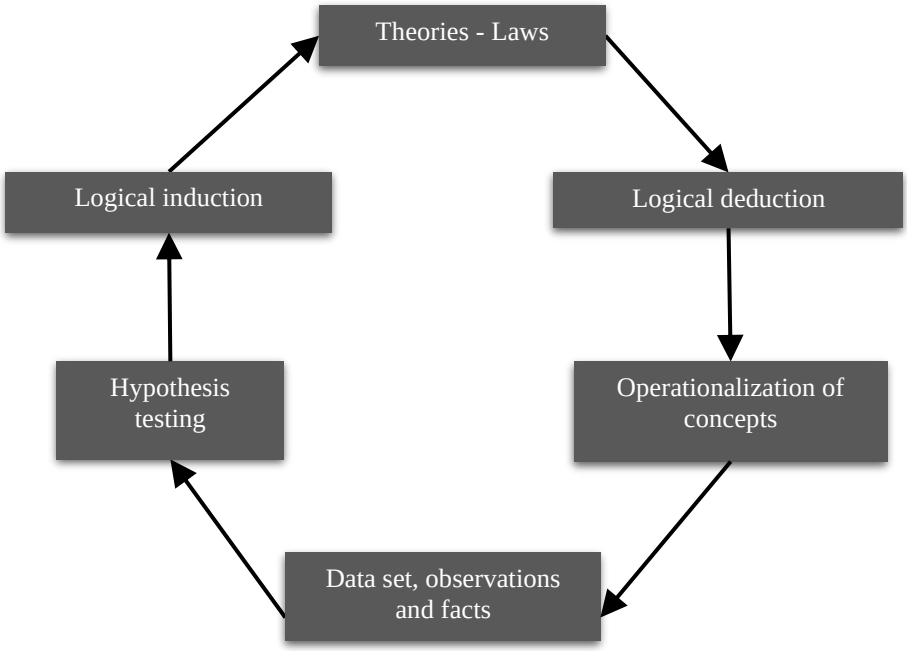

Fig. 1. Wallace's model of deductive and inductive thinking (Wallace, 1997)

3.2 Statistics and data analysis

The literature on the subject emphasizes that there are common elements between these two disciplines, even in some respects the nomenclatures on the techniques are very similar, but in practical terms they are the same [12]. Such is the case of artificial intelligence and statistics, the first one has been more interested in the development of algorithms to generate solutions to specific problems using computational power to reduce costs, while statistical methods have been more oriented to strengthen the generalizations of the results obtained (inference) [13].

In the same way, data mining, despite using some statistics techniques, differs mainly from this one because its function is to find hidden patterns in the data using algorithms in an automated way, unlike statistics, which is based on a sample of data to perform inferential or descriptive punctual tests [14].

The confluence of this great diversity of analysis techniques is opening the way to a branch called Data Science that articulates methods, procedures, and techniques to

generate and extract knowledge involving fields such as computing, mathematics and statistics, thus giving rise to the well-known fourth paradigm proposed by Jim Gray [15].

3.3 Data bases

It has been mentioned above that statistical techniques and data analysis use data as raw material for processing, therefore, they must have certain characteristics that allow them to perform the analytical procedures necessary to provide answers and solutions to the problems raised. To this end, it is important to have effective data management that allows for the appropriate extraction of inputs for the analysis processes.

The first step in achieving this effective management is data warehousing, which refers to the computational structure that allows data to be collected, consolidated, extracted, transformed, and manipulated from all areas of the organization in a centralized and comprehensive manner, thus taking advantage of the processing capacity and applicability of data analysis techniques [16]. There are some essential features that a data warehouse must have to ensure its efficiency and reliability, such as data standardization, processing, storage, agility, and security.

First, standardization refers to the fact that the data that is stored must be structured and modeled for its correct use, i.e., the organization or department in charge must ensure that the data is cleansed and modeled according to the interests and objectives of the analysis. Next, the evaluation of the storage costs must be reasoned and compared with all the alternatives that currently exist in the market, to acquire the one that best adapts to the needs of the organization. Finally, agility and security are two important conditions, as they guarantee users easy and secure access to structured data [17]. Representatively, Figure 2 shows the structure and operation of a data warehouse.

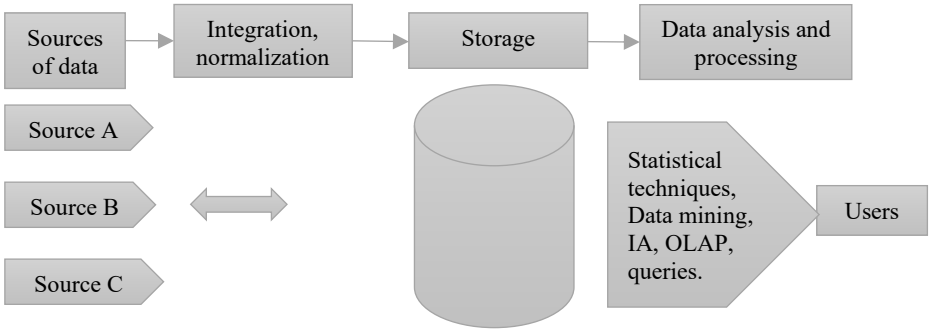

Fig. 2. Structure of a standard model of a Data Warehouse

Figure 2 is relevant if the objective of the organization is to exploit data from different sources to obtain new knowledge to support management decisions, since the organization and structuring of data will facilitate the application of analysis techniques, whether statistical or with more advanced algorithms such as data mining or artificial

intelligence. In turn, this information architecture produces other application advantages, such as business intelligence, the development of key performance indicators (KPIs) that can assist in strategic management assessment [18].

3.4 Statistical techniques for data analysis in the organization

Throughout the document, the similarity of statistics as a discipline and new trends in analysis, such as data mining and artificial intelligence, have been briefly argued, as well as the importance of having an orderly data structure that facilitates these processes. However, it is relevant to highlight some statistical techniques applicable to the analysis of data in the organization, their importance, and the need for human capital to master them.

Two main groups of techniques important for the analysis of data in the organization can be highlighted, on the one hand, those that provide descriptive information, and on the other, those that create more complex predictive and classification models [19]. These techniques are largely used to carry out commercial research processes, i.e., to determine the behavior of a certain group of customers, their most relevant characteristics in terms of preferences, tastes, and needs [20], while predictive models focus on the use of historical data to analyze time series, verify seasonality, trends and other behaviors that help forecast demand. With this information it will then be possible to make decisions on logistical aspects (inventories, purchases, storage) making the operational management of the organization more efficient, with probabilistic models typical of operations research [21].

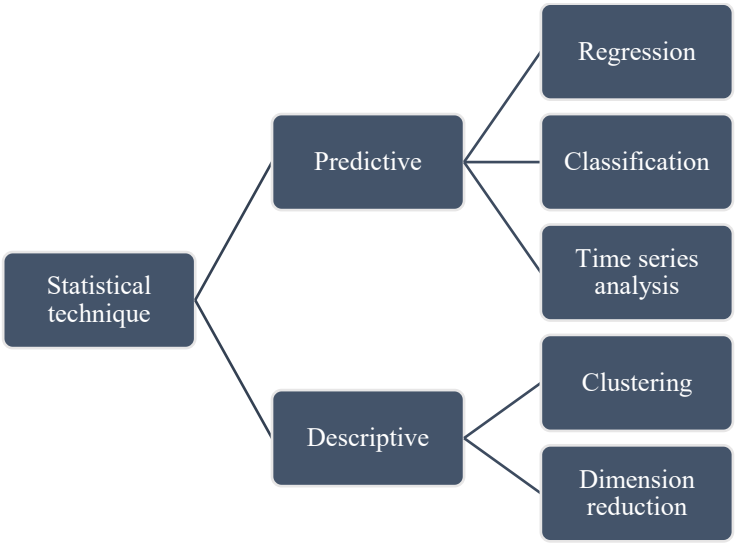

Fig. 3. Generic classification of statistical techniques in data analysis

Data analysis using regression techniques allows the creation of predictive models based on dependent variables to estimate the value of one or more independent variables with a

certain degree of precision, called goodness of fit. On the other hand, classification techniques, also called discriminant analysis, aim to create a series of equations from the data to determine the probability of belonging of a subject to a given group with an acceptable level of certainty [22].

The time series study provides a great deal of information that can be used for other processes and areas of the organization, as mentioned above. To do this, the historical data of an input is taken as an input variable, which can be sales in units for a period, for example, and thus know whether it shows any behavior, in terms of trend, cycles or seasonality [23].

Descriptive techniques, such as clustering and dimension reduction, are used to discover representative segments of the data set, that is, to identify which are the most outstanding characteristics of a particular group; with clustering it is possible to determine how they are divided and what differentiates them, on the other hand, dimension reduction uses a high volume of variables, which are classified in homogeneous groups according to certain parameters [24].

4. CONCLUSION

Currently, theorists refer to the presence of an information society, led by a high volume of data generated continuously and used to create knowledge to support the decision-making process [25]. In this sense, modern organizations must be aware of this reality and adopt strategies and actions that allow them to take advantage of the potential of data analysis.

Therefore, understanding the most representative and influential statistical techniques to produce this knowledge is a key factor in the process of implementing these processes in the organization. Thus, the training of human capital becomes a fundamental part, given that it must be able to master this type of analytical technique [26].

In short, statistics have been used in analytical information processes in conjunction with other emerging disciplines such as data mining, artificial intelligence, business intelligence, big data, and trends known as data sciences. This vision allows us to reflect on the complementarity of statistical techniques with other disciplines, the importance of understanding them and the capacity of future professionals in the administrative and managerial areas to take advantage of them [27].

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