

Total Quality Management, Data Mining and Public Services: Advancing Towards Modernity

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Abstract— This paper describes the growing interface among total quality management area, public services and information technology. The public companies have been induced to provoke changes on their working environment, aiming efficiency and service deliverance efficacy. In Portugal, this reflects in the new view its government has given on the need of containing public expenses on behalf of state's sustainability and social development through promoting a changing based on the concepts of quality. The using of technologic tools, such as data mining, is important for the supporting system behind companies' decisions. Health service, the main focus of this research, represented the propitious environment for this verification, once it is always on the top of the emergency list of modern approaches linked to technologic advancements using.

Keywords— Data mining, Healthcare, Information technology, Public services, Total quality management.

I. INTRODUCTION

The An emergency on rebuilding the Portuguese country fosters its public offices to seek the implementation of new management approaches on behalf of expenses containing, social demands, governability and sustainability, and to promote efficiency, efficacy, responsibility and sustainability, generating a need on accommodating the new structures and way of acting. Thorough studies were realized to compose a dissertation, whose main aim was to identify opportunities to maintain ISO 9001 certificate or threatens to this title that had been given to a public organization in Portugal. The methodology in use is qualitative, done through a diagnostic research, in which a model of conceptual analysis has been elaborated and had its data collected in four dimensions.

This paper exposes a narrowing which represents the interconnections among total quality management services and information technology area, wide and optimized by a Portuguese public office from the health sector.

The good practices related to the will to accomplishing public assignments for social development, by the own sector and the Country itself were examined throughout this work and represent the advances of Portugal in the comprehension of joint necessities observed and fostered for the European Union, group which this country is part as a member state.

From this fact a brief review of literature begins simultaneously, pointing out concepts concerned to

quality of services and the use of total quality especially in public services.

The questions, discussions and controversies that are shown throughout this paper present the health picture in the country and the changes made by the government that stimulated the institution to find out and implement an approach that was essentially utilized until some years ago for the private sectors in order to seek clients' satisfaction and to promote the excellence of products/services. Besides the presentation of the own institution, the ABC2 center had its original name replaced by a fictitious one in order to preserve its image.

The use of information technology on health services, concepts of informational systems and the utilization of Knowledge-Discovery in Databases (KDD) are also approached, especially the data mining which is inside the KDD process. Such tool is very important for decision making and can be used successfully for verification and analysis of the development of quality management systems in organizations.

Following, solutions and recommendations are presented taking regarding an example of practical application of data mining.

The paper is closed by showing future directions for this research and its conclusions composed by considerations about the research that unite management for total quality and public services using technologic tools so as to optimize decision making processes, essential to the performance of the institution that served as the focus of this research, by framing new changing

perspectives in the public sector highlighted by the Portuguese government from the year 2005 on.

II. BACKGROUND

The changes that have been happening on the most varied environments of social life reflect on the new management approaches that organizations have been adopted on behalf of market's maintaining and survival as fruits of the new technologies and ways of searching sustainability for the society and its future generations.

The public organizations, that make part of this group as well, are demotivated to restructuring in order to seek public expenses contention, a better attending of society demands, better governability and to foster a sustainable action for its own state.

Such preoccupation with quality has existed for a long time, however, in current days this movement is stronger and widespread, reaching out all sectors of economy by total quality stage. What used to be a goal for private companies in order only to keep their competitiveness nowadays represents also an important objective for public companies that seek to act more efficiently so as to provide improvements and more liable responses to their people through improvements and excellence on their procedures and services.

Thus, total quality management approach has been gaining strength in public service areas over the last years, by an intention of promoting changes and also reaching and keeping levels of excellence on the activities with high patterns of efficiency and efficacy.

The institution ABC2 Center, focus of the diagnostic research, is a public organization of the health sector with employees and collaborators with differentiated academic and professional graduation who have performed their services for different health areas.

By this context, the organization intended to consolidate its excellence in health service deliverance, counting on all human sources available for the implementation and the maintaining of its quality management system and to promote the spread of the perception on the needs for changes concerning to these processes together with all its staff.

Literature consulted [5] [11] [12] [18] [20] [7] reveals that there are few studies in Portugal that correlate total quality and its approach on management in public organizations.– especially those ones with complex technologies and activities, like the ones on health area– that foster the promotion of human resources management, adopting the formation as a strategy to cultural and behavioral changing, being an essential element in order to reach the company's goals.

Once the certifying process is the last step for the Total Quality Management (TQM) model implementation, it is important to consider the construction of the Quality Management System (QMS) designed according to ISO 9001 as essential for the consolidation of this organism as a pioneer on using new management approaches besides using the new technologies to promote its service deliverance development [8] [25].

The information technologies are about to give birth to a new industry revolution as important as the previous ones. This revolution has as a basis the communication expressed by the human knowledge, since mankind has developed its intelligence through the years [21].

So, organizations must classify information and the technologies it is connected to as facts so important as quality itself, control, security and development and then associate them to the many elements and concepts of contemporary life in order to ease data collection and analysis that may bring accurate information for decision making.

This way, the use of information technologies is essential for the improvement on the these organizations' performance and also for modernization promoting, sustainability, efficiency and efficacy, in the goals proposed by Portuguese state from the year 2005 on, considering the strategic position of the organisms which work in health sectors, that demand the highest data processing technology such as ABC Centers.

Use of data mining for interpreting a high number of data provides accuracy on generating necessary knowledge for organizational systems' enhancement as a whole.

Furthermore, it is important to know a little bit about the concepts that involve service quality, particularly, the public services.

2.1 Quality in Services

Due to trade intensification, mainly in service deliverance by the end of 20th century, the sector of services got similar importance to the sector of production of goods, regarding the parcel GBP represents in many countries [13].

This perspective represents a new way many companies positioned in the market, however, according to [13], the sector of services is different from the one of production of goods and there must be taken into account the peculiarities in both systems.

According [13], in non-technical processes the visualization is harder, however, they do not cease to be systems and thinking this way allows enhancements promotion, eliminating the possibilities of mistaking.

Service deliverance represents some own characteristics [13] [16]:

- Intangibility: non abstract services, in other words, using the organization's reputation or experience in order to judge the services;
- Inseparability: impossibility on being produced or stocked. Sometimes it is impossible, or undesirable to keep supplies of an explicit service element;
- Heterogeneity: explicit or implicit service elements depend on individual preference and perception, and;
- Simultaneity: production and consumption happen simultaneously, that is, in many services the consumer must be present before the services were delivered.

Characteristics highlight the difficulty on separating the productive process on service deliverance from quality management, taking into account that in service deliverance's environment the focus is in the interaction with the user [16].

Globalization, widespread nowadays, was one of the important and decisive features for the composition of current trade arrangement [15]. The technological development allowed people, companies and the government a better and faster access to information. And that also means a big change on client's position on the production chain, either the good or the service one.

Quality itself suffered an alteration on its focus that starts being the client and his /her necessities satisfaction, what embraces either production or service sectors, once the client is represented by people or organizations that purchase goods or services [13] [25].

Organizations, willing not to be out of the global trade, awoke to the necessity of having their processes certified according to the rules accepted by many countries, presenting to their costumers the evidence that they worry about delivering the same sort of service to anyone that demands it from them [10].

Measurement of quality indicators in service organizations suggests well outlined directions in the relationship with the client that sometimes raises the necessity of promoting a changing process on the institution. The human being is the most important compound of a quality program, regardless he /she is represented by hundreds of individuals or a few workers of an organization ([7]; Vitoreti & Carpinetti, 2013).

The perspective in industrial management is related to techniques and instruments from quality management which aim to collect data, to detect and analyze problems, to discover causes and to find out the solutions. They are, in example, flow charts, Pareto analysis, cause and effect

diagram, dispersion maps and regression analysis, investigation into the cause of the defects, statistical process control, tree diagram, and so on.

According to the author, in the perspective of human resources management, people are the main agents, because there would be no change without them, no matter how attractive such a change apparently could seem. So, this perspective is interfaced to knowledge, capabilities and personal attitudes of people, the involvement of all staff, the organizational culture and the human resources management practices ([5]; [1]).

Growing on total quality management approach in the area of service deliverance has fostered an interested in the public sector, especially in times of restructuration for sustainability as it occurs nowadays.

2.2 Quality in Public Services

In the case of public institutions, the relationships among individuals, the organization and its perceptions of what it is or it should be are more delicate, once the management of human resources in order to promote the growing and development of the institution comes up against the rigidity of the structure of the bureaucracy and hierarchy cemented by the Weberian model, admired by the state machine as ideal even not responding alone to the demands of this global, competitive and informational world nowadays ([6]; [1]). Because of this, many definitions are still new on the organizational practices of the public institutions.

Concerning to quality, there is still a little material about it in public area, though its concepts arose over the years. According to [3], due to the high parameter discrepancy in productivity among private and public institutions, only from the 90's on happened to be an interesting in developing any applicable literature to public management.

Public organs have as a purpose to attend their taxpayers' demands and it is important that they seek to implement mechanisms for that to happen. As these mechanisms are all connected, implementing quality programs that aim to improve clients'/users' attending represents an important step to the organizations, though it must be taken into account that there are big differences between public and private areas [3][6].

These differences are very meaningful; the government is democratic and opened, having as outcome the slowness in comparison with private sector, once in the latter decisions can be taken quickly and behind closed doors. Another differential factor is the levels of efficiency which are incomparable, once, according to [3] "The public sector needs to serve each one equally,

independent of their capacity of paying for the service or the demand for it.” (our translation) (p. 23)

According to Gomes (1997 as cited in [3]), TQM in public service:

“It can be seen as a wide process of cultural changing whose main aim is to modify institutional relationships by transforming employers and employees in partners who seek the achievement of tasks of the organization.” (our translation) (Gomes, 1997 as cited in [3], p. 24).

The intention on optioning for total quality on public management is to improve the service for the client/user decreasing public expenses over the economy and also drying the state machine so as to reach levels of efficiency and to motivate functionalism through personal and group development and to provide an enhancement on the institutional image of the organization towards.

III. ISSUES, CONTROVERSIES, PROBLEMS

3.1 Health in Portugal

In most of countries on the several parts of the world, health services are the focus of great discussions and are the mutual topic on the governmental appointment books, once their functioning complexity is a critical factor for society and its growing and flourishing.

Portuguese public institutions have been going through a much accentuated process of action and management change throughout the last years. Postures of excellence, maturity and capacity of responding have been "asked" to these institutions. Attitudes that cannot be taken if they keep following the classical and initial model of administrative approach and holding politics of the same administrative model in relation to their human resources picture.

Moreover, to provide well operating, innovation and maintenance it is necessary to move the most varied sources that contribute for a raise in public expenses. Not to mention the high cost of human resources and its formative dynamics necessary to the evolution of the system itself in the social demands deliverance.

Health in Portugal, in the last 20 years registers meaningful changes by great enhancements on health system flourishing, although there are still serious fragilities and problems which put the sector on the top of government's priorities.

Health system has been flourishing, however a strict analysis done through comparisons with other countries in European Union and the identification of other serious issues has identified that in spite of the raise on population's awareness – understood as user's preoccupation about a disease before it really occurs –

there is still a delay further to other countries in the European picture (P.O. Saúde, 2005).

So, increasing the capacity of quick and coordinated answering to threatens for health, fostering strategies of mutual and intersectional health and combating inequalities in health issues (Joce, 2004) should be the motivating pillars for the restructuring actions on this sector in Portugal.

The Ministry of Health had a heavy administrative format and had presented as another challenge the reduction on the structures by simplifying and rationalizing management procedures taking into account the enhancement on the quality of service deliverance provided to the citizens [18].

National Health Service, which ABC2 Center is a member of, is a macro-structure whose organizational model was excessively bureaucratic and hierarchic, without any mechanisms of intrinsic regulation, following what had happened to the public administration organisms that were left, fact that limited the utilization of modern management instruments, generating worrying dysfunctions on the government (P.O. Saúde, 2005).

By this assumption and the perspective of the management of the change that is necessary, a strategic plan was defined by concrete goals and measurable and innovative objectives in comparison with the traditional models of health management that had been used so far.

3.2 The ABC2 Center and the Quality

The ABC centers are essential for the transplantation process, in other words, coordination cabinets send the organs to the Centers for compatibility studies according to the area it is responsible for.

For the new reformation, this old scheme, apart from being complex, represented an unnecessary distribution of human resources taking into consideration the organisms' activities, in keeping with [18] according to the vertical or horizontal levels of structuring.

The suggestion in the report of [18] was the creation of a cabinet of quality in order to promote and ensure quality in service deliverance granting quality in services and promoting necessary activities for acquiring credibility on the EFI – European Federation for Immunogenetics.

In 2007, so, it has launched the diploma which regulated the new ABC Centers structure, whose competences and attributions had suffered modifications, putting every center in charge of activities done on its region, keeping ABC1 Center as the coordinator of *Centro Nacional de Doadores de Células da Medula Óssea, Estaminal ou de Sangue do Cordão* (CEDACE) (National Center of Bone Marrow and Stem Cells or Umbilical Cords Blood Donators).

The investigation continues to be fostered as a big motor in the seek for new solutions on health area, especially in the sub area of transplanted, once the autonomy of each center allows that they organize actions individually with other national and international organisms without focusing only on regional activities.

This way, the ABC2 Center as a result of having its quality management system certified, has shown that it is advanced on its preparation for the new time demands and that it also is incorporated to the reality that attests that the central administration has entered a dead end path and claims that the organizations present in this process were able to walk and evolve for new management approaches and responsibility inside the public sector.

So, implementing quality management through every collaborator's involvement in the certifying process represented an important step for the development of the institution in addition to amplifying and optimizing high technology use. The fact of having its quality management system certified has enabled the institution to reach recognition on the top of the health institutions picture as an attested organism. It was possible to see for real that the incorporation of concepts previously restricted and directed only to private organizations extent can be designed in a way to provide an enhancement on efficacy, efficiency and public organisms' sustainability. On the following topic, concepts concerning to information technologies, specifically approaching to data mining as a useful tool for data interpreting in health area are detailed.

IV. THE USAGE OF INFORMATION TECHNOLOGIES ON HEALTH

We know that the companies produce daily great quantities of information that would be more difficult to explore, analyze, interpret and finally decide about determined topic, without the help of the information technologies.

In the world of today, where globalization, competition, technological advances, the changing of the internal and external factors and the new social pressures, reflect the scenario where companies and other organizations depend not only on the economic order, but also on the industrial and social orders they are in, the technological tendencies and the environments of these orders change, and they need to adapt rapidly to the new conditions, so that they can survive.

This change is made in a very fast way affecting all the continents, and it is necessary and fundamental that the organizations comprehend it, particularly on what concerns the Information Systems (IS) and the

Information Technologies (IT), while the Information Systems are a differentiation tool inside the organizations.

This wide availability of big databases, coupled with the necessity of transformation of data in information and knowledge useful to the justification to the decision, is requesting high investments in software. The information and knowledge generated can be used to many applications, from business management, production control, quality control and market analysis to the project of best management of organizations human resources.

The tools and techniques used in the automatic and intelligent analysis of the enormous repository are the objects that the arising area of Knowledge Discovery in Databases (KDD) refers to [23] [22] [24]. We will see that the step in KDD responsible for the selection of methods used in the localization of patterns on data that can be interesting and relevant, as well as the adjustment of the algorithm parameters so that the extraction of knowledge can occur is the Data Mining.

From this perspective is important to recognize the interconnections between the area of information technology and the wide variety of knowledge areas, among them the one of management by quality through the utilization of a database knowledge technique, where also happens the interconnection with the systems of quality and total productive management in a way to evidence the functionality and applicability of the information systems for the taking of decisions.

4.1 Knowledge Discovery in Database (KDD) – Data Mining

The bases are an important source of information [22]. These data start to have the given due importance inside the company when they are treated and explored in an adequate way, using for this the diverse technologies that appear or that are improved day by day with KDD (*Knowledge Discovery Databases*), OLAP (*On-Line Analytical Processing*), BI (*Business Intelligence*) and Data Mining, valuable knowledge in the support to decision.

KDD steps can be divided, for a better comprehension of the stages of the process, because in each stage the results produced can be used to make the results in the next stages better, in [2] and [24]:

- Data Warehousing: works as a data base for supporting the decision, it's kept apart from the operational data base of the organization;
- Data pre-processing: consolidates relevant information;
- Data cleaning: verifies the consistence of the information and the correction of mistakes;

- Data selection: chooses relevant features in a list of features of the database.

- Data encoding: distribute the continuous values of the features in a list of intervals represented by a code, from an encoding algorithm;

- Data enrichment: adds to the existing data more information so that it contributes to the knowledge discovery process.

- Data Mining: the most important stage in the process. It's characterized by the existence of the algorithm that, facing a specified task, will be able to extract efficiently implicit and useful knowledge of a database. In other terms it's the stage that transforms data in information.

- Post processing: the output of the mining algorithm, it involves the interpretation of the discovered knowledge so that it can be improved.

Data mining is the KDD main stage, and is nothing more than the efficient discovery of good and not obvious information of a vast collection of data. It is the procedure that defines the extraction and analysis of enormous data sets, most of them disordered, so that it is possible to extract a meaning [23] [22].

It can be defined as a set of techniques, which allows extracting hidden information from a large data base, allowing later, the decision-taking. Altogether, this is the way of finding hidden patterns and relations in data base of large dimensions, which are at the same time interesting and unknown, so that is possible to extract information or knowledge from this set of data, with the purpose of decision-taking which allows a foreseeing of future.

The objectives of the data mining software are:

- Extracting hidden information patterns from large quantities of data to support the decision-taking;

- Finding the best way of extracting knowledge from the data;

- Replacing the statistic methods with less work and more dependability. The traditional methods as the spreadsheets are inadequate and not really efficient on the reading of this data, the reason why companies are joining the tools that automate the information extracting process, as in the data mining.

Types of software available are the statistic ones, apprenticeship machines and neuronal nets.

One of the most used techniques in data mining is the decision tree, also used as management tool of quality, which is of very simple usage and has a great potential. It is represented by a set of classification rules that allows classification of instances from the roots to the nodes of the leaves of the tree. The continuous variables represent

another technique used by the data mining. This type of variables can have any value in an interval of real numbers. In the classes' case, they should not be too small, neither too big.

Usage of the decision tree in the area of total quality happens through the knowledge of the management tools of quality. The diagram in the shape of a tree, as it is known in this area, is a tool that makes the detailing or splitting of an action or a characteristic in hierarchical levels objective [8], it can be used to represent the components structure of a product or to represent the functional structure of an organization.

These techniques contribute to the organizations providing strategies to obtain knowledge about the business, besides guaranteeing competitive advantage, because you can obtain the maximum of useful information and the best way of managing them. For example, the big companies, mainly the multinationals, contain a large quantity of collaborators in their staff admitting that the human resources have a strategic nature for the growth and development of them, besides being closely related to the good performance of the management system of quality, what indicates a necessity of having the correct knowledge and tools when evaluating the performance and accomplishment of the goals, besides monitoring and follow the personal performance and development [24]. The usage of the applicability of data mining has found a rich area in the corporative world. The companies are attentive to the power of information they collect every minute (and in enormous quantities), so they invest continually in new technologies which aggregate value to their business.

The effective application of data mining techniques reaches different ventures [2] [24]:

- Mining the DNA: mapping activities of sequences (patterns of sequencing on large scale), the searching for similarities and comparisons, and identification of co-occurring genetic sequences have found in data mining powerful computing resources;

- Medical data mining: hospitals, clinics and health care plans, more and more interested in the improvement of procedures (diagnostics and treatments), search in KDD ways of maximizing resources and results, preferably with cost-cutting. Examples: tomography images mining, exactness in the prescription of tests and procedures;

- Financial data: the application of data mining goes from the detection of fraud and money laundering to market analysis, trends and speculative stimulus. The consumers credit analysis and clients classification for

marketing strategies appear among the most usual applications.

- Commercial data: selling analysis, clients' behavior, products turnover, seasonal phenomena and regional preferences stimulate big investments in data mining. Besides that, it is possible to assess advertising campaigns, to leverage the e-commerce, assess and stimulate clients' fidelity.

Telecommunications: large demand on detection of invasions and anomalous behavior in systems, assessment of usage and traffic, analysis of consuming patterns [23] [14] [19] [22].

V. SOLUTIONS AND RECOMMENDATIONS

Regarding to the kind of information that can be produced by the data mining software, we can point out:

- Classification (forecasting);
- Clustering (description);
- Association rules (description).

On classification, characteristics of the objects are analyzed and they are given a pre-defined class. In other words, this is a technique which consists in the appliance of a set of examples of pre-defined classes to develop a model capable to classify a larger quantity of records.

Classification is very used in areas such as medical diagnostics, fraud detections, risk analysis on banking or insurances, financial market trends and identification of objects in large data bases.

On Clustering some data are grouped according to their connections logic and consumers preferences. It's similar to classification, but here the classes are not so pre-defined, ex: decision trees, neural nets, clusters detection and association rules. It is the method in which the records are grouped in a set, in other words, it is a set of data objects, similar among them in the same cluster and not similar to the objects outside the respective cluster. For example, the data can be explored in a way to identify market segments or consumers affinities [22] [24].

In the association rules, the data can be explored to identify associations. The objective is to find models that identify dependency among the variables, which means, they identify themselves in groups of associated data.

[5] agrees that "the human resources management play a very important role in quality management, in tangible goods or service goods" (our translation) (p. 212), pointing out that in the services quality its importance is superior, because in this sector the excellence on personal performance is fundamental, consequently the importance of this area influences its respective function.

So, for example, in the human resources area data mining is a very useful tool because it helps managers on being effective about collaborator development. Allowing the manager a better comprehension of the reasons of some happenings from past and present, giving more reliability in the projection of future scenarios, as well as a bigger strictness and objectivity on decision-taking, which will not be based on instinct or personal impulse anymore. What implies to say that it is a tool that helps to develop a business culture based on knowledge and contributes to the solidification of quality management systems, because it provides gathering and interpretation of data to the necessary control on behalf of keeping quality in the organizations.

Some examples of where we can verify the efficiency of the usage of this tool in human resources are in recruitment (estimative of future recruitments), in waging politics (wage and bonus previsions), in career management (collaborators references and potential), in the own company strategy (talent retention), among others.

The quality of the service begins in the hiring process (recruitment and selection), after that the organization needs to manage the human resources, through motivation management, working satisfaction, worker performance, among others [5]. Making a survey about the important information for making a better management of these resources is an area in which the technique of data mining can be used, because the correct usage of the information will generate decisions that continually look for clients' satisfaction, interns and externs clients, propitiating an increase in the quality of services.

VI. CONCLUSION

Although the State is seen as a provider of services and necessary goods for population welfare by some schools of thought and intervention, according to neoliberal belief it is not like that. According to neoliberals, the State should not interfere directly [6] [7], but serve as regulator that works as basis of legal support so home market and inter nations market were guided by the market natural logic. This neoliberal proposition has been repeatedly refuted by numerous capitalism crises, mainly due to the most recent one in 2008. In its more recent arrangement, the State has, as a rule, institutions that regulate its own functioning. Some of these organizations respond legally as public enterprise, but they adopt the logic of business organizations, since they have relative autonomy of management and conduction of "businesses", adapting themselves, timely, to the demands arising from their environment. They provide services to society, for

instance health institutions which dynamics do not allow bureaucratic delay in some decisions.

The object of study is embedded in healthcare area and to take a look over the structures widen the dimension's perception of the restructuring proposed by the Portuguese government, from 2005.

To research such an object, the approach of total quality, its quality systems and pertinent rules was chosen considering that the Portuguese public area became exempt those approaches in its process of restructuring. Although such approaches have been used a lot in restructuring processes of public Portuguese organizations, as well as in the world, it was observed that a huge gap of texts focused in public area existed. Because of that, the revisited bibliography in this study was, preponderantly, focused in private, industrial and service organizations.

The shift in attitudes and behaviors begins with the board of directors and its perception of the need on transforming organizational culture and even more, to realize that who may change the culture are the people, through understanding of changes, its collaboration and responsibility by participation.

Boards of directors of organizations should always take into account that the understanding of the organizational process variability and of people, seeking to know the capacity of each process and the sources of uncertainties inherent to them.

Understanding the various perspectives of management by total quality, being one of the people who, endowed with competence, capacity, knowledge and attitudes [4], are agents initiators of the transformation and necessary changes to organizations, it widens the look to the importance of inserting human resources in every step of the process, fostering their collaboration and participation in the change.

The predictions, the results sought by organizations to their daily practice are ineffective if it is not considered in the first place the human factor and their ways of being in the world, in other words, it is crucial the perception that people are different, they learn in different ways and the speed varies. Including, interfering and interacting in the process of improvement in a differentiated way. To the top management should be encouraged participation and accountability by all the ones involved in the success of quality management system which will result in a good projection of the organization as a means of action at all levels - local, national and international.

Being aware of the need of changes and singularities inherent to sustainability of the public sector fostered a reflection about new managerial approaches and shifts

and in the "concern" with these organs workers. Such matter becomes neuralgic as the Portuguese public sector and its employees, particularly, formed under the influence of the bureaucratic paradigm, firming up the false idea that public services are a concession and not a purpose of providing services.

Especially after Portugal became a member of European Union and the need of preserving its maintenance on the block, the bureaucratic paradigm that had influenced so much the constitution of the Portuguese public services started to be questioned and its organizations were urged to change. The Portuguese public structures were rethought taking in consideration that it did not serve the new criteria of performance and provision of public services with efficiency, effectiveness, responsiveness and quality. The transformation of employees in partners of projects and goals to the organizations is essential to the success of implementation of new and modern management approaches.

Finally, the ABC2 Center, in walking the path to modernization, followed the macro objectives proposed of restructuring of the Portuguese public administration and that certainly responded the wishes of development and sustainable progress of all Portuguese society. The ABC2 Centre, as other organizations that follow the same path, is in a phase of maturing of its new management approaches and collaborates with its successful performance for the welfare of the society, through the search for excellence in providing quality services and with quality for all levels – local, national and international. However, this path of success might be interrupted in the case of the new management model do not consolidate and evolve in the sense of a management model ruled by the principles of total quality management.

Getting to know the initial concepts about the quality, the systems and their amplification and application to other distinct areas of production itself is essential [9] [7] to widen the perception of the importance and relevance of the theme within the new perspectives available to organizations which desire to throw themselves in search for more efficiency, effectiveness, response and sustainability in relation to providing services to internal and external users.

Linking to this perspective technological tools will help managers in the business' direction for the development, maintenance and growth in the competitive market, it is important because these are very useful for control and better definition of objectives for the strategic work of developmental organizations.

Future challenges relate to the monitoring of maintenance of the quality management system for continuous improvement and survival of the system, because it was a big step towards broadening the scope of activities for the Center ABC2 and consolidation of the challenge to modernize and change following the trends macro and objectives proposed for restructuring the public administration in an effective way and consistent with the aspirations of moving towards sustainable development and progress of Portuguese society.

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REFERENCES

- [1] Andion, C. (2012). Por uma nova interpretação das mudanças de paradigma na administração pública. Cadernos EBAPE, 10 (1), 1 – 19.
- [2] Aurélio, M., Velasco, M. & Lopes, C. H. (1999). Descoberta de conhecimento e mineração de dados. Apostila. Departamento de Engenharia Elétrica, PUC- Rio de Janeiro.
- [3] Bastos, R. M. (2005). Análise e Adaptação de um Modelo visando a Implantação do Sistema de Gestão da Qualidade baseado na NBR ISO 9001:2000 na Divisão de Ensino da AMAN. Dissertação de Mestrado, Universidade Federal de Itajubá, Itajubá. MG, Brasil.
- [4] Bertelli, S. B. (Orgs) (2004). Gestão de pessoas em administração hospitalar. Rio de Janeiro: Qualitymark.
- [5] Bilhim, J. A. F. (2007). Gestão estratégica de recursos humanos (3.ed). Lisboa: Instituto Superior Sociais e Políticas.
- [6] Bonina, N. (2009). Qualidade total no serviço público: os caminhos de uma instituição pública portuguesa rumo à certificação ISO 9001:2000. Dissertação de Mestrado, Instituto Superior Miguel Torga, Coimbra, Portugal.
- [7] Bonina, N. & Patrício, J. Z. (2012). Qualidade e formação como fatores importantes na reestruturação da administração pública portuguesa: o exemplo do setor da saúde. Rev. Adm. Pública. 46(1). 271- 290.
- [8] Carpinetti, L.C.R. (2010). Gestão da Qualidade: conceitos e técnicas. São Paulo: Atlas.
- [9] Carr, D. K. & Littman, I. D. (1992). Excelência nos serviços públicos: gestão da qualidade total na década de 90. Rio de Janeiro: Qualitymark.
- [10] Faria, J. H. & Oliveira, S. N. (2007). Gestão da qualidade, subjetividade e desempenho organizacional. In J. H. Faria (Org.). Análise Crítica das Teorias e Práticas Organizacionais. (pp. 190-202). São Paulo: Atlas.
- [11] Giraldes, M. R. (2005). Avaliação do SNS em Portugal: equidade versus eficiência. Revista Portuguesa de Saúde Pública, 23 (2), 21-44.
- [12] Graça, L. (2006). Políticas integradas de protecção e promoção da saúde e segurança do trabalho nas empresas portuguesas. Revista Portuguesa de Saúde Pública, Temático (6), 75-94.
- [13] Hoff, C. H. Y. (2005) Avaliação dos Resultados da Aplicação da Estratégia Seis Sigma em um Restaurante Industrial. Dissertação de Mestrado, Universidade de Taubaté, Taubaté, SP, Brasil.
- [14] Machado, J. G. C. F. & Nantes, J. F. D. (2011) Adoção de tecnologia da informação em organizações rurais. Gest. Prod. , 18 (3), 555 - 570.
- [15] Neves, C. F.. (2004). Descoberta de padrões usando técnicas de extração do conhecimento. Relatório de Estágio, Centro Universitário Luterano de Palmas, Palmas, Tocantins.
- [16] Oliveira, O. J. (2006). Gestão da qualidade: tópicos avançados. São Paulo: Pioneira Thomson Learning.
- [17] Programa operacional [P.O.] saúde (2005). Direcção-Geral do Desenvolvimento Regional. Lisboa: Editorial do Ministério da Educação.
- [18] Programa de reestruturação da administração central do estado [Prace] (2006). Relatório Sectorial Final – Ministério da Saúde. Lisboa: Editorial do Ministério da Educação.
- [19] Rasia, K. A., Diehl, C. A., Macagnan, C. B. & Souza, M. A. (2011). Gestão de custos de cadeias de produção do agronegócio: análise sobre publicações em congressos e periódicos científicos. Custos e @gronegócio [on line], 7 (3), 21 - 39.
- [20] Reis, V. P. (2004). Gestão em Saúde. Revista Portuguesa de Saúde Pública, 22 (1), 7-17.
- [21] Rigaud, L. (2002). Os sistemas de informação na empresa. Porto: Rés Editora.
- [22] Silva, G. B. & Costa, H. G. (2015). Mapping a core starting of references in Data Mining from journals published in Brazil. Gest. Prod., 22 (1), 107-118.
- [23] Silva, M. P. S. (2004). Mineração de dados – conceitos, aplicações e experimentos com o Weka., Instituto Nacional de Pesquisas Espaciais (INPE), São José dos Campos, São Paulo.
- [24] Souza, J. T., Francisco, A. C., Kovaleski, J. L., Oliveira, B. A., Batista, A. A. S., Canteri, M. H. G. (2016). Knowledge creation through data mining: a study o association rules in weka database. Espacios, 37 (6), 24 – 37.
- [25] Vitoreli, G. A. & Carpinetti, L. C. R. (2013). Análise da integração dos sistemas de gestão normalizados ISSO 9001 e OHSAS 18001: estudo de caso múltiplos. Gest. Prod., 20 (1), 204 - 217.