

Research Article

Use of new management techniques in the Italian Health care System

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Abstract: The Italian healthcare system is operating in a condition of economic crisis; this system must conform its activity to the criteria of efficiency, effectiveness and economy without disregarding the quality of the services provided, as defined by law. In Italy, in the last five years, the managers of the healthcare system realized that the Management Systems they use were not able to better manage the complex reality of the healthcare facilities, because these systems could hardly give an exhaustive interpretation of the reality. The solution that we believe will give the best results both in terms of improving the knowledge of the processes and in terms of improvement of process management is to adopt the technique of discrete event simulation (DES) coupled to the theory of business process management (BPM).

Keywords: Business Process Management, Discrete Event Simulation, Healthcare Process Analysis, Management Control Systems

INTRODUCTION

The Healthcare Sector [1] is characterized by a mechanism of demand and offer different from the classical functional paradigms typical of the commercial systems; the health products are not easily measurable and the payment for each product not always corresponds to the relative cost.

In order to quantitatively analyze the healthcare processes, it's crucial to take into account the role played by the healthcare information systems. The Healthcare Information Systems should make traceable all the activities performed within every department of the healthcare organization under inspection. In Italy, however, due to the rapid and disorganized development of the healthcare information systems, the fragmentation of the available information make hard to find the data required to properly analyze the processes. Therefore, it becomes even more important to identify the most appropriate techniques to easily and unambiguously deal with the healthcare processes examination. These methodologies should be able to pinpoint the complexity and the variability characterizing the healthcare context.

MATERIAL AND METHODS

The frequent changes and realignment of business processes with regard to variations in daily operations, require careful handling from both the point of view of organizational analysis and the tools used in order to ensure the best integration and adherence to business strategies [2].

Business Process Management

The Business Process Management (BPM) [3] represents the permanent adaptation of business

processes to the needs of a changing market. BPM is the sum of the activities necessary to create, organize, manage and improve the business processes. The strength of the BPM consists in taking advantage of information technology to increase the effectiveness and the efficiency of enterprises. In a highly diversified and uncertain context, as is the healthcare sector, the BPM can be the tool that helps to manage the changes that the healthcare organization has to face. It can allow the company to continuously improve their business processes, revealing potential savings and benefits resulting from the improvement of activities.

Discrete Event Simulation

The simulation is a technique that replaces real experiences with guided experiences that evoke, or replicate, substantial aspects of the real world in an interactive way, "protected" by the unexpected reality [4]. The Discrete Event Simulation (DES) [5] is the most used simulation technique for the analysis of the systems whose state changes instantaneously with respect to time. In the Healthcare context, the analysis techniques based on the paradigm of simulation [6] offer the opportunity to study the system from different points of view and to obtain different solutions depending on the precision characterizing the created models.

The simulation allows to design different execution models of the same process; therefore, different models, representing different possible representations of the reality, can be realized to address specific questions useful to analyze the process.

One of the main advantages of the simulation is the chance of modeling the situation exactly as it could

occur in the actual world. Different models can be created using DES, each one with its own behavior. Through the simulation tools, we are able to design systems that can replicate, an already existing reality, adding new functional solutions and/or events, in order to study their effects in the process execution. Furthermore, the addition of particular events allows to evaluate alternative design choices for the system under consideration. Through the simulation, the operating behaviors of the system can be defined at any time and/or dimensioned in a probabilistic manner. This is a great advantage, as it allows users to make a systematic examination of their choices, starting from the same model. All the analysis performed using DES systems represent either a global environment, or the representation of a specific workflow or procedure; in both the cases the purpose of the model is to compare different strategies in order to identify the one that best fits the criterion of decision makers.

STATE OF THE ART

The DES technique, in Italy, is used for the analysis of the business process within manufacturing companies, while it is less used in the healthcare sector. Every object in the model has particular impacts on what it is going to happen in the whole system; the duration of each activity can be defined through specific functions, usually represented by specific probability distributions, that can be defined with high level of flexibility in order to have a wide choice of the adopted solutions to set according to the reality under investigation.

The simulation models, in addition to being an alternative to the use of analytical models, are proposed as a support tool within any decision-making process whose use is particularly useful as a support of:

- Design of new systems;
- Improvement of existing production conditions;
- Dynamic Performance Verification of layout;
- WHAT-IF Analysis;
- Improving knowledge of already existing realities;
- Comprehension of the operative logic of the production process.

The main reason underlying the spread of the simulation technique in healthcare at international level is its capability to deal with dynamic realities, allowing the analysis of complex systems in an easy way. It's important to take into account that it's not always possible to test new operating methods on the real system, especially in those contexts, as the Italian Public Healthcare system, in which every experiment cannot be carried out without compromising the system itself. The simulation carried out through a DES system has a lower cost than the real experimentation.

The power of the simulation is represented by the chance, once built a model, to apply, with simple modifications of the parameters of the model, all the possible changes required to examine all the possible variants of interest for the stakeholders. Therefore, it should be possible, through this model, analyze all the possible behavior of the actual system.

The activity of simulation is composed by several stages. First of all, a model is designed in this step all the operating procedures are defined. Secondly, the events characterizing the system are generated. Finally, from the simulated system, a series of statistical observations on the performance of the system are obtained.

STATE OF RESEARCH AND EXPECTED OUTCOME

Our research activity focuses on the identification of suitable techniques to quantitatively analyze healthcare processes, in order to measure performance and simulate improvements. Examined the main process measurement methodologies applied in the most important healthcare systems in the world [7-9], we considered the discrete event simulation (DES) [10-11] as a promising and suitable methodology applicable for the analysis of the Italian Healthcare System. Thanks to its extreme versatility and flexibility of use the DES technique is able to provide quantitative representation of the process and to help and support the operators in the identification of the most appropriate management solutions in order to manage the process.

We are trying to apply the DES methodology - using SIMUL8 software - to some particular case study, belonging to the Healthcare System of the Campania Region. In these studies, the DES has been used in support of the classic methods of Management Control.

These studies are still in progress, but we have seen that, using this technique, is possible to obtain some new information about the processes of the healthcare facilities, for example quantitative information about the activities that are being carried out in the structures; such information are crucial for the stakeholders both to improve the processes execution and to have better information about the processes.

It has also be noticed that the use of the simulation technique applied to a particular functional area of these organizations were considered suitable to be extended to the whole structure; a typical example is represented by the measure of service times and costs.

The DES technique allows to analyze deeply the activities carried out in the structure concerning for instance the resources responsible of the execution of

the activities; the time required for the execution of each task can also be estimated.

It is possible to clearly and precisely identify the characteristics of the examined workflow from the analysis of the information obtained from the Simulated Model; also is possible to know specific conditions of inefficiency or queues in the process execution, and corrective actions can be evaluated in order to improve the performance of the analyzed processes.

The powerful of the DES system is related to their capability of quantitative showing the effects deriving from changes in the workflow, as the reallocation of resources among different activities. The stakeholders, indeed, need to acquire quantitative knowledge not only on the actual process, but also on the impact that every change in the workflow structure can have on the whole system. After identifying the DES as the technique suitable to analyze healthcare systems, we are working to improve the aspects related to its practical application. We are convinced, indeed, that this technique could be the best analysis technique to be applied in the Italian Healthcare Sector to be able to obtain a qualitative and quantitative improvement of health care processes of existing health facilities.

Actually the research activity is oriented in defining a structured and well defined implementation methodology that could be adapted according to the critical aspects of the reference context. The use of the DES systems in healthcare indeed, will allow to:

- Develop mechanisms to obtain a reduction of implementation costs;
- Improve efficacy and effectiveness;
- Improve the utilization of the Control Management Systems;
- Clearly define the methods for collecting data and information required to structure the system in a comprehensive and solid way;
- Identify the ways of analysis and the operational phases, in order to obtain accurate and robust simulation models;
- Build models that can be scalable and easy to be managed;
- Build models clearly and easily interpretable by the stakeholders;
- Define a methodology to validate the created models, so that they can be considered a "standard" and reproducible.

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