

# Urgency/Emergency Health Processes' Modelling: A Case Study

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## Abstract

The growing complexity and sophistication of the organizational information systems, and hospital ones particularly, render difficult their comprehension and, consequently, the implementation of control mechanisms that may assure, at all times, the auditability of the above mentioned systems, without having to use models.

This paper, framed in a wider investigation, aims to describe the application of techniques and methodologies, in the sphere of action of Organizational Engineering, in the modelling of business processes developed in the main Operating Theatre of the Coimbra's University Hospital Emergency Service, as a support for the implementation of an information system architecture, using for that purpose the CEO framework, developed and suggested by the Centre for Organizational Engineering (CEO)<sup>1</sup>, based on the UML language.

## 1 Introduction

The organizational processes' modelling confronts us with two problems (both very important and that should be considered during the modelling process): (1) the need to adopt high-level informal models that may be easily built, providing an approximate perception of what is intended and (2) the need to adopt formal and detailed models of hard and complex construction [1], but necessary if one wants an accurate representation that may positively influence the *stakeholders* trust on the modelling processes.

With the support of the performed modelling it will be possible to: (1) analyse the ACID characteristics of the main transactions unchained in the health processes; (2) perform its formal verification; (3) implement an internal control system and (4) design an auditing architecture, in real time, assuring the constant auditability of its information systems.

## 2 Methods and Materials

We shall use a mixed approach suggested by Gospodarevskaya in [2], based on the modelling methodology, using the CEO framework suggested by the CEO, research group at INESC-INOV, and on ethnographic methodology.

It must also be pointed out that the entire modelling process has taken in consideration a modular and independent perspective of the technology that might be

used in the implementation of the auditing architecture that may be suggested.

The CEO Framework relies on the definition of three main concepts: business strategy; business processes and information systems. It resorts technically to the creation of a new profile for the UML language, which will allow the description of the above mentioned organizational concepts [3].

This framework contains a finite set of business objects, with which business models are built. The business objects considered in the framework are: the goals; for the strategy' modelling; the processes, for the business processes' modelling; the resources, for the business resources' modelling and the blocks for the modelling of architectural blocks of the information systems.

Besides the business goals the CEO Framework also describes the relations among themselves, as well as a set of predefined elements which, based on basic concepts, represent the best performed actions in the modelling area.

## 3 Modelling

According to the fourth modelling principle [4], no model is sufficient on its own. Therefore, any non-trivial system is better portrayed through a small number of reasonably independent models. So, to develop the modelling of the emergency service in study, we have considered the following scenario, which correspond to its chain of value:

- Patient's Admission:
  - Reception;

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<sup>1</sup> The CEO does research and development in models, methods and tools for organizational engineering. It is an autonomous research unit of INESC (private non profitable business and academic institutions' association).

- Identification;
- Patient's Sorting:
  - Evaluation of the event's seriousness; and,
  - Identification of the nosological entity
- Health Care Providing:
  - In the general emergency;
  - In the specialist central emergency;
  - In the peripheral emergency;
  - In the emergency;
  - In the short term internment unit.

The organizational architecture of an information system is mainly made from two perspectives: (1) static perspective and (2) dynamic perspective.

### 3.1 Static perspective

The static or structural perspective allows the evaluation of the hierarchic relations between components of the diverse main activity's objects, allowing the verification of the effectiveness of the mentioned implementation of hierarchies.

This perspective is also very important in order for one to establish a communication means, using the same language between both modelling specialists and the actors involved in the modelled activities, giving it thus a global perspective, identical to all parts involved in the modelling project.

### 3.2 Dynamic Perspective

The behaviour description of the different business objects is of great interest since it renders easy the communication between the business modelling specialists and the specialists in systems' development.

In this paper we have chosen to represent the processes identified in the Emergency Service of Coimbra's University Hospital dynamically, using diagrams of the UML activity. Each of these diagrams will correspond to a model of an operating area.

### 2.2 Informational Model

While defining the informational model, the object guidance is used. The objects with similar characteristics are grouped in classes. A class may be a subclass of another, inheriting all of its characteristics.

A class may be defined by its attributes, by the actions that may be summoned, by the events that may be described, by the subclass that it generates and by the super class in which it is contained.

In this paper, the informational model suggestion of the Emergency Service of the Coimbra's University Hospital is made of the resources' classes that may be involved on the execution of its processes. In this context, we see as relevant the sub-classes: "Patient"; "Health Professional" and "Patient's Companion".

## 4 Results

As a result of the performed modelling (during this first stage of our case study) we have defined the workflow and the informational model for a major university hospital's emergency service (Coimbra's University Hospital).

## 5 Discussion and Conclusion

The process' modelling is an important tool in the definition of a risk evaluation methodology. As we have already mentioned, the CORAS project suggests a risk management methodology based in the application of modelling techniques using the UML language, that allow the use of diverse analysis methods normally used in risk management processes.

The knowledge of a transaction's characteristics in a socio-technological perspective, as we have already pointed out too, is vital for one to model the inherent process to each transaction and to apply methodologies of risk management based in formal models.

The modelling suggestion that we have presented shows that it is possible, using the CEO Framework, to model processes, on one hand, to a level of abstraction that allows its comprehension without making the task too complex and, on the other hand, in which a formal logical may be introduced, that will allow to use that same language in risk management methodologies.

The obtained workflow and informational model allow one to begin the second phase of this study case. This second stage consists of the ACID characteristics of the main transactions involved in the health processes developed in the Emergency Service of Coimbra's University Hospital.

## 6 Literature

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