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# WHAT CAN ORGANIZATIONAL ANALYSIS GIVE TO REQUIREMENT ANALYSIS ?

## *Developing an Information System in Hospital Emergency Departments*

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**Abstract:** In this article, we develop a method of Requirements Engineering (RE), based on the contributions of the theories of the organizations. This method was developed within the framework of an IS project led in three Hospital Emergency Departments (HEDs) in Belgium. The method intends to take into account as well the functional aspects of the specifications as their political and cultural dimensions. The method that we propose is built on three theoretical levels: the first is mechanical or functional and allows us to describe the existing organizational structure; the second is relational or political and allows us to understand this structure in action; finally, the third is cultural or symbolic system and opens to us with the values which guide the actions in organization.

## 1 INTRODUCTION

Empirical studies relating to the development of Information Systems (IS) shows that the Requirements Engineering (RE) is one of the most critical phase of the development of an IS project and its success (Boehm, 1991, Chaos, 1994-2001, ESPITTI, 1996). Generally, one considers that RE rests on two principal sources of information : the description of the field of application of the project and the requirements and expectations of the different categories of actors, direct or indirect users of the future system. On the basis of this information, the conceivers draw up then the specifications of the future system that is to say the expected functionality's and behavior of the future IS.

The quality of the specifications is thus directly related to the quality of the information collected on the application field and the requirements of the future users. And the quality of this collect of information depends on the theoretical model used to understand the existing organization and the

requirements of the various actors. Very often, the models stick to a functional and rational vision of the organization, leaving on side the less rational aspects of the human behavior in organization. The importance of these less rational or functional dimensions in RE appeared to us shouting within the framework of an IS project developed in 3 HEDs<sup>1</sup>. Initially, this project aimed at improving the efficiency of the coordination of the care and the management of flows of patients within these services. Presented like such, the project seems very mechanical directing the glance of the analysts towards the workflow and the structures which underlie the activity of these services.

But the things are never as simple. Very quickly the first confrontations with the grounds of the HEDs showed us how much the relatively intangible and abstract elements such as the equity of treatment of the patients, the quality of the care, the global approach of the patient, the assumption of each

<sup>1</sup> An inter-university project (UCL, FPTMS, ULg, FUNDP) financed by the Walloon Region in Belgium (2000-2003).

responsibility, the management of the stress, etc. were dimensions important to take into account in RE although the traditional methods of engineering are not prepared to. To capture these more intangible elements, it appeared necessary to enrich the organizational visions which generally chair RE. It is from this point of view that we worked out a model based on three dimensions.

## 2 FROM CO-ORDINATION TO LOYALTY: THE CONCEPTUAL FRAMEWORK

The central assumption on which our model rests is that a relevant representation of organizational reality concerns three dimensions.

The first dimension is purely mechanical or rational. Resting on classic work, such those of March and Simon (1958), Thompson (1967), Galbraith (1973) and Mintzberg (1979), it considers the organization under the angle of the structures implemented to back the activity. From a pure mechanical point of view, the structure aims to *co-ordination* and puts back on two contradictory orders, namely, on a side the differentiation which consists in simplifying the activity and, on the other the integration which aims to connect it. The efficiency of a structure depends on balance to find between these two orders. In RE, the approach by the existing structures is our first entrance point.

This first approach does not say anything on the way in which the actors make function these structures. All occurs in the mechanical approach as if the structures functioned all alone. However, the operation of a structure of organization depends on the behavior of the actors. It is them which, through their actions, produce these structures and contribute to transform them. But this "acting together" is far from natural... It however puts in the presence of the actors with various interests which must together manage their interdependencies to make "turn" the organization. This idea brings us to the second dimension of our model, in which the analyst will try to understand the way in which the actors grasp the existing structure, operate with it and transform it to regulate their necessary *co-operation*. (Crozier, 1963; Crozier, Friedberg, 1977; Friedberg 1988; Friedberg 1993).

The third dimension intends to understand the principles and the values on which the actors support their actions and decisions in organization. According to Boltanski and Thevenot (1999), the problem of acting together in an organization is not only a problem of co-operation between various and

personal interests but it is also a problem of convention to define between various representations of values and principles that should guide the actions and decisions in organization. With this third dimension, it is the *loyalty* of actors which is questioned or the way they can find and define a community of values, legitimate for each of them and giving an acceptable meaning of their work.

## 3 FROM THE CONCEPTUAL FRAME TO THE METHODS PROPOSALS

In this section, we will present the research methods that we use to describe the domain and to define the requirement in HEDs. The initial system requirements must allow patients to be tracked continuously from first contact to the time they are discharged, and also allow data to be shared among several responders who may be miles from the scene.

The methodology used has two main characteristic features: first of all, it is multi-disciplinary and combines concepts and techniques from two disciplines, namely Organizational Sciences and Software Requirements Engineering; and secondly, it is participative and aims at strongly involving the actors concerned about the computerization of the organization.

To collect the relevant information for the RE, we chose to follow the principles of qualitative research based on case studies as defined by Yin (1990): because it places emphasis on the dynamics at work in a fully contextualized perspective. This focus is justified by the complexity of the HEDs fields.

We proceeded to two periods of observation at each site in order to better capture the structure and the dynamics of action in the three HEDs. This first range of information was completed by interviews with relevant actors (nurses, doctors and administrative staff) in each of the considered HEDs.

Let us explain now the method followed to apply our model to RE in the 3 HEDs.

### 3.1 The organizational context: the co-ordination approach

The first dimension of the analysis aims to understand the current state of the organization, in a pure mechanical analysis.

To understand the structure of the HEDs, we have initially to analyze their external context in order to locate the various pressures and constraints coming from their environment. Then, we have focused on the objectives which structure these 3 HEDs. To do that, we have applied the typology of Mintzberg concerning goals.

To analyze the organizational structure, we identified principles of the division of tasks, specialization's and the system of roles, and we attempted to determine the organigram of the organizational unity analyzed. In the same manner, we paid quite close attention to mechanisms of integration. Such mechanisms can be of many kinds, involving existing hierarchies, norms and procedures, values.

At the end of this stage, we were able to proceed to an initial organizational diagnosis of the structure and dynamic of the organizational units under consideration.

An organizational diagnosis of this existing situation aims at evaluating how satisfactorily the identified objectives are met. This led us to the identification of certain functional problems linked to the handling of information and the management of interdependent relationships between various emergency response actors, having to do with information.

This initial diagnosis also allowed us to build different scenarios that illuminate the extent of the field of possibilities regarding the future information system.

### **3.2 The map of actors and their interdependence: the co-operation approach**

The second dimension focus on actors and the way they manage their necessary co-operation.

Depending on the particular information system one is attempting to design, the identification of actors is done in a contingent manner, through determination of the various parties who are to participate in the design of the system and its future use.

We have therefore set up what we call a map of actors, their identification and their relationships which connect them. We were particularly interested in exchanges of information between actors, since this is an essential and important power resource (Crozier, Friedberg, 1977). The nature of such information and the mode of exchanging it were noted in specific observations.

After having identified the actors and their exchanges of information, we have focused on the

way in which each one perceived its role, its resources and its interests in this network of interdependences. We also considered the way in which the actors perceived the role of the future IS, expectations and resistance's to which this one gave place. This collect of information can only be accomplished through in depth interviews of actors involved in the system being constructed.

Actor's interests in a situation in which a new information system is about to be introduced can never be predicted because the situation is always quite fluid. The basic idea is that these interests do not necessarily coincide with those of the organization such as these might be identified through a mechanical analysis such as was presented above.

Collective action always depends on participation by members, and this participation is always negotiated through leader, even implicitly. The terms of this kind of negotiation are exactly what we were trying to identify.

The understanding of those terms allowed us to narrow down the field of possibilities identified in the initial diagnosis, yielding specifications which were certainly less optimal than those which would have been produced by the mechanical analysis, though more satisfying or practical regarding the actors and their positions.

### **3.3 The "common higher principle" identification: the cultural approach**

With the cultural approach we wanted to take into account the forms of justification (Boltanski, Thevenot, 1999) which are mobilized by actors in order to legitimate their actions and their perceptions of the information system which was being constructed. For this, we based ourselves on the typology of "Economics of Worth". We sought to identify in the 3 HEDs. We founded on

- the "common higher principle" held to by those at the scene, principle which could serve as a basis for constructing agreements regarding the the system to be designed ;
- and on, the "states of worth" which characterize what is "the greater" or "the smaller" with regard to the higher principles which were identified. These permanent states allowed us to determine what is legitimate within the organization but also regarding the future IS.

We obtained those data from specific documents, as rules and charters defining the missions and the

codes of conduct to be applied in the HEDs. But this stage of the analysis can also be assisted by discussion sessions with the actors so that changes which are acceptable can emerge from dialogue. Our recourse to a symbolic level allows us to understand the norms and values which help to regulate the behavior of the HEDs'professionals. It also allows us to test different possible ways of constructing the IS, these possibilities having different meanings and legitimacy for various actors.

#### 4 CONCLUSION

This article underlines the interest of bringing together Organization Sciences and Requirements Engineering to build an information system which is a success i.e. which is adapted to users' expectations and who is finally used.

If the approach seems profitable, it remains to convince the world of the IS in developing some formal tools able to represent those intangible dimensions of the organizations.

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