

# ORGANISATIONAL SEMIOTICS EMBEDDED IN A SYSTEM DEVELOPMENT CYCLE

## *A Case Study in a Business Organisation*

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**Abstract:** Searching for competitiveness and excellence in quality, business companies have revisited their processes generating new demands for the Information Technology (IT) department, involving knowledge that goes beyond the software development itself: understanding the organisation, its processes and businesses as a whole. Regarding software development methods, we have perceived significant advances in the technical aspects of software development lately; but the same attention had not been directed to the domain analysis which could have serious consequences in the applications and in the company. As a way to contribute in this direction we have investigated the use of Organisational Semiotics in real contexts of systems development. A case study discussed in this paper involves the use of this theoretical basis in a real work situation for evaluation purposes.

## 1 INTRODUCTION

Literature has shown that requirements specification and its validation are determinants of the success of the information systems development (Ehn and Lowgren, 1997 and Liu, 2000). When we deal with organisational changes, it is vital to line up the IT solution with the business objectives and necessities. Thus, the success of a computer-based system in supporting the organisational changes will require the agreement of stakeholders, users, developers etc. on business, processes and technical questions as well. Moreover, the social, cultural and organisational aspects of the problem must have a more decisive role in the development processes, than the technology itself.

In this paper, we will present and discuss the introduction of a new process of information system development, based on the Organisational Semiotics, in the Information Technology (IT) department of a particular organisation. The work adopted a qualitative approach and the techniques selected were participative observation, interview, fieldwork and notes taken during the process (Simoni and Baranauskas, 2003a). The meetings were recorded and revised by the participants.

The paper is organized as follows: Section 2 briefly presents the theoretical basis for our work:

Organisational Semiotics and MEASUR methods. Section 3 briefly describes and discusses the case study and present results achieved during the activities and Section 4 concludes.

## 2 THEORETICAL BASIS

Organisational Semiotics (OS) is the study of organisations using concepts and methods from Semiotics (OSW 1995). The rationale for OS is based on the assumption that any organized behaviour is affected by the communication and interpretation of signs by people, individually or in groups.

An organisation can be seen as an information system in which interdependent links between the organisation, the business process and the IT system occur (Liu 2000). At an *informal level* there is a sub-culture where meanings are established, intentions are understood, beliefs are formed and commitments with responsibilities are made, altered and discharged. At a *formal level* form and rule replace meaning and intention. At a *technical level* part of the formal system is automated by a computer-based system. The *informal level* embeds the *formal* that, in turn, embeds the *technical level*, meaning that changes in any level reflect in others.

**Organisational Semiotics and the Information System Development**

We see in OS a basis to cover the gap we find in traditional system development methodologies, related to studies of organisation, their values and behaviour. It is agreed that OS methods allow the interested parts of a focal problem a better understanding of their requirements and intentions, as well as restrictions of the information system (Liu 2000).

We have considered the Stamper’s MEASUR (Methods for Eliciting, Analysing and Specifying Users’ Requirements). Stamper (1993) proposed a set of methods to deal with all aspects of information system design, which are concerned with the use of signs, their function in communicating meanings and intentions, and their social consequences.

**3 A SOFTWARE DEVELOPMENT PROCESS INFORMED BY ORGANISATIONAL SEMIOTICS: A CASE STUDY**

The case study discussed in this section was conducted at Gradiente, a Brazilian company that produce technological solutions for electronic consumer goods. The partnership established with Gradiente occurred at a moment when they were reorganizing their IT department. We made an agreement of partnership that, briefly, involved the following steps: a) to understand the expectations related to our proposal; b) to adapt a training programme to their possibilities; c) to train in the new approach; d) support the documentation; e) to supervise a pilot development; f) to evaluate the case study and g) to review of development process documentation.

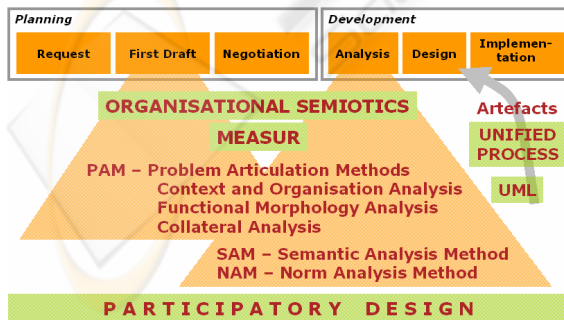


Figure 1: The system development cycle with MEASUR methods.

Figure 1 shows the result achieved by integrating the Gradiente development process with

Organisational Semiotics, and the MEASUR methods.

The development process was organized into phases, of iterative development, in a way that the Planning and the Analysis were based on MEASUR and the Design and Implementation were based on Unified Process and UML.

In the next sections we present the development of an application based on this process, discuss the achievements, and present some feedback got during the process.

**3.1 The Enterprise Resource Management (ERM) Application**

The application to be the first pilot project for evaluation of the new Development Process involved the enterprise resource management (ERM) that initially would deal with IT resources.

The work was carried on sessions of 3 hours/day for meetings with the user representatives and one day/week for work evaluation to consolidate the results and pendencies. In the next sessions we discuss the accomplished work, according to the established development process.

**3.1.1 The Planning Phase**

The process has started with a meeting with the IT manager, for problem understanding. Another meeting with the responsables for IT was carried out to define the role that each participant would have in the project. In the sequence, we started with the MEASUR methods as shown by Figure 2.

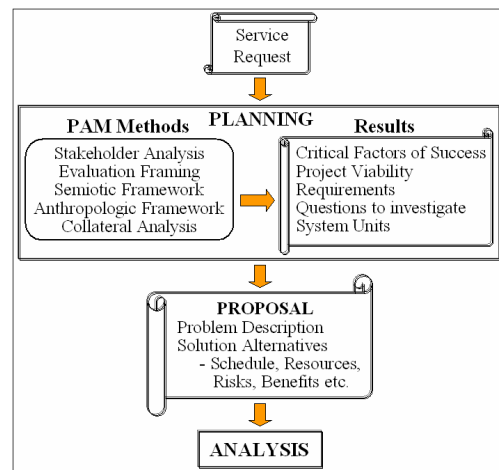


Figure 2: The First Draft outcomes.

**PAM – Problem Articulation Methods**

**Stakeholder Analysis** helps in identification of the interested parts in the focal problem. The team considered that all the Gradiente employees are potentially involved in the process, because they consume IT resources. All the managers, in a near future, and more immediately the IT managers constituted the parts that would use the information to manage their respective departments. During the analysis, they realize that the participation of all involved persons was significant in the process.

The participants reported that they had discussed aspects that usually would not have been discussed in the normal process. For example, verifying that the service suppliers (Telefônica, Xerox etc.) could be affected by the project, as revisions of contracts could occur.

**Evaluation Framing** is used to identify, for each stakeholder, which would be its interests, questions and problems, to discuss possible solutions.

We could observe that the group compared Gradiente’s reality/necessity with the Market practice, not only regarding prices, but also the cost / benefit evaluation for each resource. This was an aspect that they reported not usually discussed in their previous practice.

**Semiotic Framework** allows the analyst to expand his analyse beyond technical issues, placing the IT solution among other possible solutions to the organisational questions, discussing with the stakeholders other level of relationship (physical, empirics, syntactic, semantics, pragmatic and social) which direct or indirectly affect the project.

**Anthropologic Framework** aims to verifying, for each stakeholder, problems in the process and the important conditions and questions to be addressed, regarding interaction, association, subsistence, taxonomy, time, space, learning, creativity, defence and exploitation aspects.

**Collateral Analysis** allows the analyst to investigate many components of the entire project, which could impact costs, schedule and the success of the project if not treated in an adequate moment.

After working with PAM, they get involved in the elaboration of the solution proposal.

Based on the informal, formal and technical layers of the Gradiente’s organisation, a discussion was conducted to review the IT situation in the organization. They were in a transition from an informal Information System to a formal one. They realized that they had to consider the informal system, understanding and reorganizing it from new IT goals and mission; otherwise they would have the system supporting practices and processes that would not exist in the near future.

From this discussion, they agreed that the continuity of the ERM project was possible, and that they had the information needed for modelling. They had also an expectation that the new approach for analysis could assist them in getting a more generic model of IT resources management.

**3.1.2 The Development / Analysis Phase**

This phase was initiated with a meeting to revise the schedule and the role of each participant (Figure 3).

**SAM - Semantic Analysis and NAM – Norm Analysis**

During the analysis of the Proposal they initiated the identification of some norms and realized that it would be interesting to record them. Although literature (Liu, 2000) places the two analyses separately, this approach, presented good results, strengthening the characterization and definition of each semantic element.

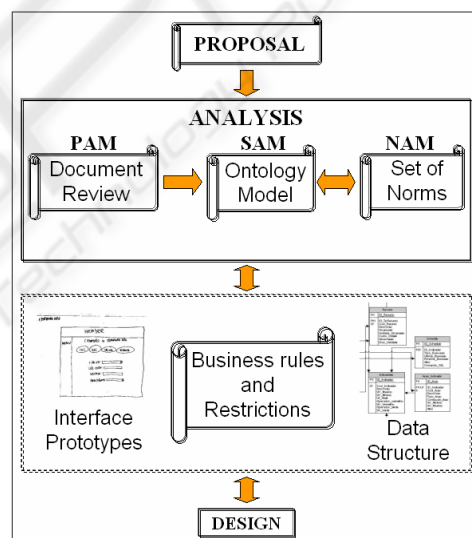


Figure 3: The Analysis outcomes.

As the number of discovered semantic units grew, the group felt the necessity of having the graphical visualization of the relationship among the units. They started to create the Ontology Diagram (OD) and represent Norms on it. This process demanded periodic revisions in the diagram, but it also revealed itself strong in terms of provoking more discussion about the context being modelled.

We observed that the level of abstraction represented in the model enabled them to go beyond discussion on IT resources management. This level of abstraction was a very important result, because this difficulty had been pointed out in studies carried out previously (Simoni and Baranauskas, 2003b).

For the Norm Analysis, the process involved to verify, for each diagram element, whether it would have norms associated. The process was finished with a revision on the Proposal document.

The last two sessions of the Analysis phase were dedicated to the elaboration of the user interface prototypes and data structure. We observed that the transposition was done directly from OD elements to the corresponding screen elements, as mentioned in previous work (Simoni and Baranauskas, 2003b). We verified that OD contributed to the interface organization into menus, screens and information to be entered and visualized. Prototyping contributed also to the validation of Semantic and Norm Analysis, as the prototypes reflect the materialization of the model and refinements on it.

### 3.2 Highlight of Results

As a practical work in a real company, we could effectively test the potentiality of the proposed approach. The choice for an IT internal project with medium complexity allowed us to work with low pressure of schedule, facilitating the revisions and experimentation that were necessary. During the process, we could observe the expectations and results reached with new approach, illustrated below in their comments.

*"... It is based on the way communication is carried through, clarity of meanings, etc. (Semiotics). Normally we have difficulty to communicate with non technical people and use technical terms"*.

With the discussion occurred by the end of the Planning phase, we understood that they accepted the approach and that it added value to their development process, mainly in the activities of requirements eliciting, one of our research focus.

*"We are leaving a situation in which we make the thing and think about it later. When the process finishes we realize that it could have been done in a different way". "If we think earlier we don't make many mistakes"*.

By the end of the Analysis phase, we observed that the methods had been well assimilated and had brought an improvement in their process of understanding the problem and its context. In a different way that they use to work, the new approach led the group to discussions beyond the technical questions:

*"After the training I didn't feel confident. The confidence came with the practical works... The documentation is complete, with a sequence that allows to have a problem definition and documentation of its context"*.

By establishing the Solution Proposal as a document that links the Planning and the Analysis we covered the gap that we had observed in other case studies (Simoni e Baranauskas, 2003b).

The outcomes of this case study allows us to say that it was viable to introduce the concepts and methods of the Organisational Semiotics into a system development cycle that, according to comments and observations, generated an adequate documentation in volume and content, treated the department of information system as a whole, including the technical system.

## 4 CONCLUSION

Studies in user requirement eliciting need to address how people understand the world and how to represent this understanding.

The results of the case studies suggest that the involved people had good understanding of the approach, which allowed them to practice the methods proposed by Organisational Semiotics and MEASUR (PAM, SAM and NAM), mapping elements of the analysis to interface prototypes and data base.

Finally, the work that was initiated in the company continues, to verify the influence of the approach in the quality of the software application, and brings us the perspective of new projects in partnership.

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