

Regulation in Information Systems at the Level of Tunement

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Abstract. Information Systems (IS) have a major impact on human activities. They are not only “objects or products” because they directly concern our access to knowledge, our possibility to assume activities and even our survival in this economic world. Due to these IS stakes, we propose to position the regulation process at the level of initiatives in the IS development, more exactly, in the context of the IS tunement between the worlds of human activities, systems, conceptual models and ontology.

Keywords. Regulation, information systems, world-object, alignment, e-Government, conceptual model, ontology

1 Introduction

The concept of *regulation* is not often used in the domain of Information System (IS) although it is a well known concept in the general theory of systems. Obviously, regulation processes for systems programming and implementation are available for IS because of the fact that an IS must be programmed and implemented. But, an IS cannot be reduced to a computerized system. We have to invent a more central position for the IS regulation process. In this paper, we firstly present the IS stakes for an enterprise or, in more general sense, an institution, and even for the society in the case of e-Government. Secondly, we introduce four main worlds of an IS and we propose a position for the IS regulation in order to observe and regulate crucial points in the IS development and evolution processes. Finally, we illustrate our approach with a case of e-Government.

2 IS Stakes

The domain of software engineering contains many situations of regulations which are pertinent to improve the quality of the systems to be developed. These traditional artefacts have a local impact on human activities. Due to this locality, we know how to construct rigorous and formal backgrounds to develop methods for their development and their implementation. We can obtain a patchwork of implemented systems, each of them having a specific utility. We can master a system, and even

more, we can have the feeling of possessing it because that we know how to define it, how to implement it and how to use it. These artefacts are *objects* (ob-jectus: which is outside of ourselves, but not too far for our thinking). For these artefacts there are *users*. The users are *active* subjects taking information from the *passive objects*.

However, through the IS domain we enter a new dimension. We are not any more outside the IS itself for the reason that it continuously interacts with our own activities. We are not any more in the situation of *active subjects* who can master the system with passive objects but in the situation of exchanges where the active roles and passive roles may be inverted. The IS itself becomes a mandatory condition for accessing knowledge, assuming activities and even surviving. As a consequence, the IS domain asks us to leave the traditional schema relative to *objects*. Certainly, an IS has objective quality as *objects*, which can be observed and analysed. But, in a more generic way, it acts on the global constraints of our own life and on our own survival conditions. For us an IS is a *world-object* [4]¹.

Any traditional attitude to design an IS follows a kind of one-way or linear causality category, even with sophisticated feedback or spiral movement (to determine users requirements and objectives, then from these results to construct specifications and to implement them and finally, to analyse users satisfaction). Such an attitude is not any more sufficient to surmount the complexity of the IS domain even if it keeps some pertinence locally: a pertinent IS investigation must take into account new categories of interaction, transaction, organization and teleology².

3 Position of IS regulation: IS Tunement

A lot of papers concern the *alignment* of the *business policy* and the *informatics policy* [1]. Some authors claim that it is necessary "to bridge the gap" between these two domains. This point of view does not take into account the power of initiatives of these two domains and that their processes of initiatives are independent. Even if a *bridge* between these two worlds can be built, it will be immediately destroyed because of the movements of these two worlds. Therefore, for us, no bridge is possible and no alignment (in the strict sense) can be achieved. The IS domain is much more complex.

Our approach is based on four worlds: *conceptual model*, *activity*, *system* and *ontology*. The notion of conceptual model was introduced in the last 80's by several research teams but we give to it a new role – the role of interoperability between the two previously mentioned domains. The world of conceptual model has its own properties and concepts, roughly speaking, the world of information semantics integrating static and dynamic aspects in the same model and related constraints. Furthermore, it has an overlap with the activity world, and this overlap concerns

¹ This paragraph is strongly inspired by [4].

² This paragraph is strongly inspired by: "Compared to the analytical procedure of classical science with resolution into component elements and one-way or linear causality as basic category, the investigation of organized wholes of many variables requires new categories of interaction, transaction, organization, teleology..." [6].

enterprise models. It has another overlap with the system world, and this overlap concerns the specifications. The process to go from one world to another must be seamless: what is decided in one world must be implemented trusty, without modification in the other world. For instance, all the informational specifications decided in the conceptual world must be precisely respected in the implementation of the corresponding system. The conceptual model can be simplified into a concept model, generally called *ontology*. For us, ontology contains all the invariants of the IS domain, in particular knowledge but also some business rules, roles of persons which are independent of the IS development. For example, in the domain of e-Government, the laws belong to ontology.

Therefore, an IS is in fact composed of four worlds, which have their own principles and properties, their own independent power of initiatives. We identify two crucial situations in the IS development where we will introduce the IS regulation process:

- Since each IS is always in movement due to the initiatives taken in any of its parts, in any of these four worlds, a crucial activity in the IS domain is to assure the tuning between these four worlds. We call this part *IS tuning*;
- Due to the IS stakes mentioned before, crucial and autocratic initiatives must be avoided as their impact on the enterprise, institution or society concerns many people. For that reason, the initiatives should be submitted to a more *democratic* process.

4 IS Regulation

The main property of a system behind regulation is named homeostasis. “Homeostasis is the property of an open system, especially living organism, to regulate its internal environment to maintain a stable, constant condition, by means of multiple dynamic equilibrium adjustments, controlled by interrelated regulation mechanisms” [7]. In this work we investigate another approach to reach homeostatic IS. To assure the IS homeostasis, we need a regulation process concerning the crucial point of the initiative process. Who is allowed to take initiatives and how? The centralized power is now irrelevant due to the IS stakes, due to the complexity of situations which cannot be overcome only by general considerations. Furthermore, due to the IS stakes, any autocratic initiative process will fail. The initiative process needs the participation of many persons, as many approaches claim. But, the question is how to manage it with a regulation process? For this purpose we introduce the notion of *regulation committee* and we illustrate it through an e-Government case.

4.1 Informational Space of the Regulation Committee

The regulation committee must have an informational space to work, which should be the most objective as possible. If we consider the four IS worlds, only the ontology world have this quality.

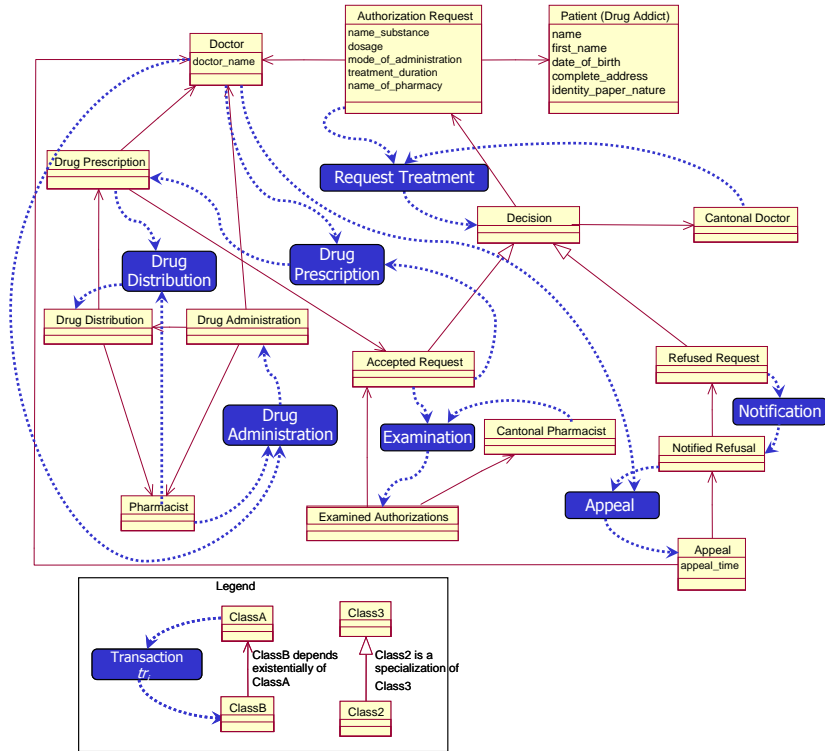


Fig. 1. IS Ontology extracted from the Geneva law K 4 20.06

For example, in the domain of the prescription of narcotics (drug) intended for the treatment of the dependent people (the Geneva law K 4 20.06³), we model this law (see Fig.1) in terms of our ontology model (essentially based on the existential dependency relationships between concepts) [5, 2]. A transaction tr_i in this model has one or more pre-transaction classes $clPre_j$, and one or more post-transaction classes $clPost_k$. If completed, tr_i interacts with the objects of $clPre_j$ and produces new objects in $clPost_k$. In this model, conditions in entry or in exit of a transaction can be complex Boolean expressions.

³ The law describes the procedure that each doctor must follow to fill a request of authorization in order to prescribe a narcotic for the treatment of the dependent people (drug addict). The doctor must obtain an authorization from the cantonal doctor before the prescription of any narcotic. The law also describes how the drug has to be distributed and administered. The pharmacist, on the basis of the authorization delivered by the cantonal doctor, provides the doctor, or directly the patient with the prescribed drug. (http://www.geneve.ch/legislation/rsg/f/rsg_k4_20p06.html)

In this paper, we limit ontology to the law. This result is objective and is more or less independent of modellers (*some variants can happen for details*).

4.2 Regulation of Information Spaces of Actors

In the law, there is no consideration of the information spaces of the major actors. Because of the fact that organisations were paper-oriented, the legislative power did not take care of it when promulgating a law. But now, in the epoch of computerization, the IS developers must know the access rights to be implemented. Without any regulation process, these decisions have to be mostly made by the IS developers. Thanks to the ontology for the actor “Cantonal doctor” illustrated in Fig. 2, it is possible to decide how the main actors will work together and the regulation process has then the role of a moderator in the IS development process.

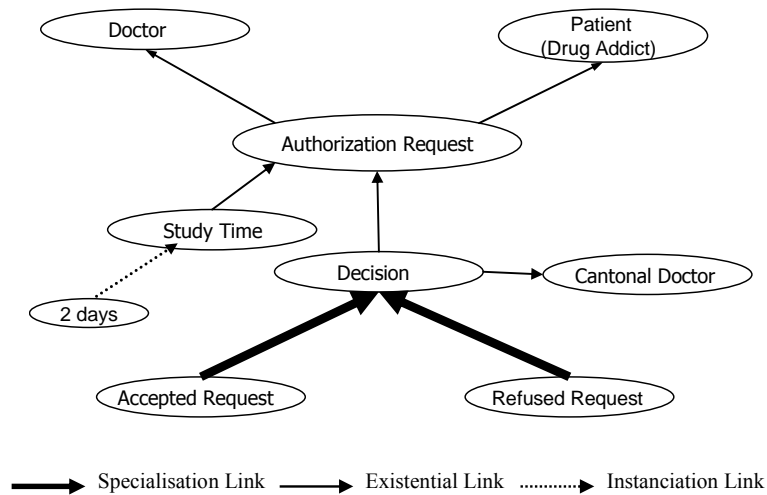


Fig. 2. Informational space for a Cantonal Doctor.

4.3 Regulation of Initiatives Concerning the Way of Organization

Any person competent in observing ontology model can take initiative to elaborate *new* kinds of organization. In our example (Fig. 2), there is only one *cantonal doctor* and only one *cantonal pharmacist*. Why? This position could have a political background: the majority of the Assembly thought that only one person must be in charge of this activity. Moreover, this position could have been taken implicitly: due to the paper-oriented organization it was *normal* to think that *one cantonal doctor is sufficient* in order to avoid cumbersome administrative procedures. But now, with computerized IS, this reasoning is not valid any more. The regulation committee must

analyse this initiative and, maybe, to decide to transmit for modifications of primary or secondary legislation.

4.4 Regulation Concerning Grounds of Activities

Any person competent in observing ontology model can take initiative to elaborate new kinds of activity with respect of the grounds. In our example (Fig. 2), the cantonal doctor *decides* to accept or not the demands. Why it is a *decision* and not only a *control*? Indeed, with an IS it is now easy to create a datawarehouse for the role of cantonal doctor and therefore this role can control the activities of pharmacist and doctor and eventually to disqualify them in case of failures.

The ground of a *decision* – the decision is written in the law – could have political background: the majority of the Assembly thought that only one person must be in charge of this type of decision. Besides, this ground could be implicit: due to the paper-oriented organization it was *normal* to think that *only the cantonal doctor must take the decision* to avoid cumbersome administrative procedures. The regulation committee must analyse this initiative and, maybe, to decide to transmit for modifications of primary or secondary legislation.

4.5 Participation

The information technology creates new kinds of situation, which were impossible to foresee before, in particular in the case of promulgating laws. But, these situations exist and cannot be hindered. How to do with them? In our example, one question appears: who is allowed to observe the information stored in the IS? Any citizen? Is it possible for any citizen who wants to propose an amendment to the law to have access to the IS and to perform some data mining processes? At another level, is it possible for any citizen to have access to the ontology model and to the conceptual model to be able to propose consistent evolution at any level? All these questions concern e-Participation in the e-Government field. But they are broader and relevant for any IS.

5 Conclusion

Regulation is a major concept for any system but it is much more relevant for open systems than for the closed ones. In the traditional IS approach, the domain of initiatives is much more a closed system than an open one. Due to the progress of information technologies and also due the IS stakes and their impact, it is impossible to stay in this position in a democratic country. This is particularly true in the domain of e-Government in order to avoid autocratic decisions with severe impact on the Society. Considering the IS initiatives as an open system, we proposed in this paper the notion of the regulation committee. The role of the regulation committee is to work with an objective model from where several opinions can be established consistently. Such a model is proposed to be an ontological one. Besides, we

described in this paper several major situations of the regulation committee activities and illustrated them with a case of e-Government.

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