

Institutional Information Systems engineering: the laws based approach

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Abstract. Our research proposes a framework for Institutional Information Systems (IIS) engineering based on the laws, therefore, called the laws based approach. In this framework, the legal texts are exploited as main source of knowledge for IIS engineering. Legal texts describe in a precise way concepts, rules and constraints governing the given institutional domain. The exploitation of these sources of knowledge permits to enhance IS adequacy and compatibility with institution activities and to find stable common information for IS engineering in perspective of sustainable development.

1 Context and Motivation

Nowadays, more and more activities of the real world are supported by the Information Systems (IS). Therefore, IS constitutes one of the most critical components of an institution. In order to be conformed to the changes in their environment, these institutions are constrained to rebuild the pre-existing IS. Several research and industrial projects have addressed these specific problems of concerning IS reengineering and IS evolution. In this context, several research and industrial efforts concentrated on creating new and more efficient development methodologies and processes in order to support intensively the institution activities of the persons who are in charge of tasks and decisions.

The institution activities are governed by legal texts that regulate their execution. Thus, the contents of legal texts for the institutional domain are indispensable. Therefore, these legal texts are considered as a common universe of discourse for all the persons concerned by the IS. An IS is continuously modified due to the evolution of informatics environment as well as the modifications of its organisational environment. In this movement, it's important to have stable components. The legal texts are stable in this movement. In other words, the exploitation of these legal texts permits to find stable common information, which is necessary for institutional activities, and which should be used in the perspective of IS engineering. This information is used to form the kernel of the IS. This kernel can evolve to integrate the organizational aspects, which are not described in the legal texts.

2 The laws based approach

Our research domain aims at providing new approach for IS engineering. This approach allows to clarify the links between laws and IS, in particular the alignment between the amendment of laws and the evolution of IS. The evolution of laws is a remarkable phenomena outside of the IS that may provoke the evolution of IS. In this case, the evolution of the laws is considered as an event. We consider three types of event :(i) amendment of a law, (ii) abrogation of a law and (iii) introduction of a new law. After each legislative event, it is important to identify the parts of IS, which require an evolution. The impact of this change on IS is precisely identified.

In our research project, we apply the method components [6] to develop the institutional IS. These method components aim at constructing four levels of IS infrastructure: (i) the level of IS ontology, (ii) the level of IS kernel, (iii) the level of IS implementation, and (iv) the level of IS activity modelling. These different levels are not isolated, they can be coordinate to support the activities at the global level.

The overall view of proposed approach for IIS engineering is synthesised by the figure 1:

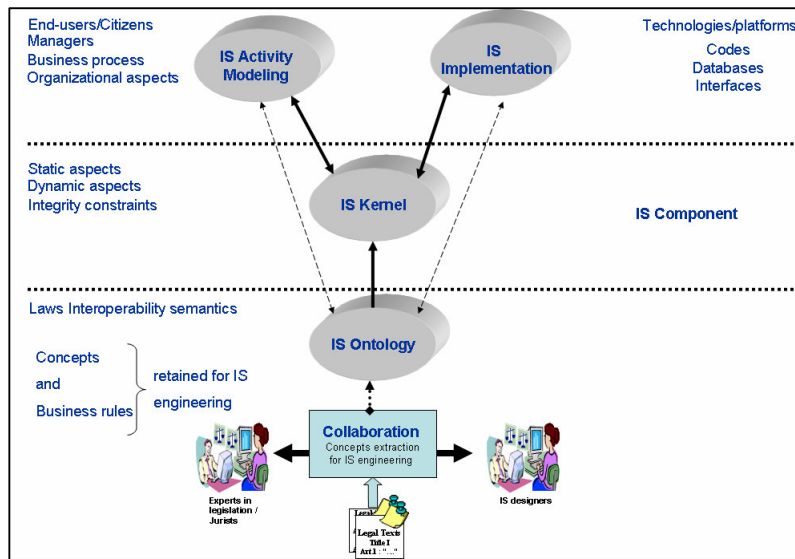


Fig. 1. IIS engineering.

In our standpoint, the level of IS ontology play the most important level. This level will conduct the construction of other levels. For this reason, our research concerns with the construction of IS ontology.

Providing indisputable “universe of discourse” based on legal texts is the first purpose of these method components. For a given domain, we propose firstly, to identify the set of legal texts such as laws, and application regulation, etc. which formalize the institutional domain. A domain can concern several legal texts. The aim of this step is to extract the IS ontology model. It defines the concepts that describe the knowledge contained in the legal texts, which can be exploited at the activity modelling level and at the level of implementation through the level of IS kernel. The study of each of these texts should be made only in the perspective of IS engineering. The question to answer is: ‘How to determine in the legal texts the IS parts, which have to be modified and how to determine the business rules contained in the texts of law’. The legal texts contain information and knowledge of purely legal nature, which cannot be considered in the IS. Only the characteristic concepts of the domain are identified and retained.

IS ontology model provides a reference for IS designers to discuss and understand the ways in which they view and interpret the institutional domain. It allows to conduct the evolution of the IS, which have been adapted to the evolution of the legal texts. IS ontology level remains independent from technologies and business practices.

The analysis and interpretation of certain laws is really a complex process. In fact, an important effort is required to carry out this process. Therefore, the collaboration between experts in legislation and IS designers is necessary for this task. We developed a first prototype of a collaborative platform to support their tasks of extracting relevant concepts from laws. This prototype of a collaborative platform has put into practice. At present, we are continuing our work on improving the protocol of collaboration between IS designers and experts in legislation.

Besides, another interesting question is how to structure this “universe of discourse” in order to establish indisputable IS kernel. IS engineering requires the use of models to support the rigour and the communicability between the various actors and levels.

In our work, we use a conceptual graph namely *conceptual map* to represent the IS ontology model [3], [7]. A conceptual map is an oriented graph in which the nodes are the concepts and the edges between concepts are either (i) instantiations or (ii) existential dependencies or (iii) generalization-specialization links.

The main characteristics of our conceptual map are:

- It does not distinguish the static aspect from dynamic aspect (static-dynamic integration). These choices concern the implementation level and not the ontological level.
- It uses only existential links, generalization-specialization links and instantiation links. These links are easy to understand; they do not introduce ambiguity and can be directly implemented. These links permits to describe the remarkable situations contained in the legal texts.

As mentioned above, the IS kernel is derived from the IS ontology model. For this reason, the mapping guidelines must be defined. The derivation process asks the IS designers to consider the IS with an operational optic. They have to make choices and to decide for each concept and each link between concepts if it is mapped into a class, or a transaction or an attribute, and so on. An IS kernel can be a formal or semi-formal representation. The kernel can be described through several diagrams which represent different aspects of IS such as the static aspects, the dynamic aspects and the integrity rules aspects. It represents the information, which is handled, used and exchanged by the activities of the institutional domain.

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