

# Urbanization of Information Systems with a Service Oriented Architecture according to the PRAXEME Approach

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**Abstract:** This article addresses the problem of urbanization of information systems. The development of an information system company is certainly a complex task. Hence the choice for organizations to opt for an urbanization approach of their information. In our work we are interested in a comprehensive approach to recast Information System (IS). This approach is oriented service (Service Oriented Architecture), based on a mapping and an orchestration of business processes related to the IS.

**Keywords.** SOA, Business Processes, Urbanization, Web Services.

## 1 Introduction

Everyone is willing to say that the information system is now at the center of running a business or an organization. Its operation and its efficiency are of an utmost importance.

An information system is a set organized of resources including hardware, software, personnel, data, and procedures to acquire, process, store and transmit information in companies. During the life of the company and its development, the information system is caused to change both in its structure and in its operation.

In response to these permanent developments, the idea of urbanism has been integrated within modern companies. The basic principle of urban planning in IT is, through rules and fundamentals principles, to follow these developments and its impact on the overall system.

The development of an IS company is certainly a complex task. Hence the choice for organizations to opt for an urbanization approach of their IS. Such an approach becomes necessary when the organization has accumulated a large number of projects over several years. Urbanization of IS designed to meet several objectives: the streamlining, modularity and more innovation. It is nevertheless a concept to simplify it, to use a term extension.

This paper is organized as follows: principles of urbanization IS are presented in section 2. Section 3 discusses basic elements of urbanization IS approach. Section 4 presents the context of our application case. Our urbanization approach is described in section 5 and the architecture system in section 6. Finally, we conclude and bring out some perspectives in section 7.

## 2 Principles of Urbanization Information Systems

Urbanization of IS has been studied by many authors [1-3] [5] [14]. The work of these authors complement the work on enterprise architecture. All these authors use metaphors to justify the notion of architecture and urbanization of IS. In particular, the metaphor of the city is used as the basis of urbanization of IS.

Club Urba-EA<sup>1</sup> offers the following definition: « Urbanization is to organize the gradual and continuous transformation of information system to simplify it, to optimize its added value and to make it more responsive and flexible towards strategic business changes, while relying on technological opportunities of the market. Urban planning defines rules and a coherent, stable and modular context, in which different stakeholders are referring to any investment decision in the Information System. »

The mapping is the set of studies and scientific, artistic and technical operations involved from the results of observations or the operation of documentation, to the development and the establishment of maps, plans and other expression patterns, and then their use [2].

Mappings are at the heart of the approach to follow for a project of urbanization of IS. We distinguish four types of mapping (business mapping, functional mapping, application mapping and technical mapping) that can be made to describe the existing system or the target system. As with city, the mapping of an IS is to time [1]:

- Scientific: isn't it a metamodel?
- Artistic: aesthetics is also a mean to facilitate communication.
- Technical: implementation is based on a number of techniques.

The process of urbanization is based on three key areas that feed each other [1]:

- Modeling strategy
- Mapping of existing systems
- Determination of target systems

The process of urbanization of the IS includes:

- Set a target IS, aligned to business strategy,
- Determine the path to follow to achieve this target IS.

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<sup>1</sup> [www.urba-ea.org](http://www.urba-ea.org)

### 3 Basic Elements of Urbanization Information Systems Approach

#### 3.1 Process

**Process Notion:** A process is a collection of related, structured activities or tasks that produce a specific service or product (serve a particular goal) for a particular customer or customers. It often can be visualized with a flowchart as a sequence of activities with interleaving decision points or with a Process Matrix as a sequence of activities with relevance rules based on the data in the process [13].

There are three types of processes [13]:

- *Management processes*, the processes that govern the operation of a system. Examples include Corporate Governance and Strategic Management.
- *Business (Operational) processes*, processes that constitute the core business and create the primary value stream. Examples include Purchasing, Manufacturing, Advertising and Marketing, and Sales.
- *Support processes*, which support the core processes. Examples include Accounting, Recruitment, Call center, Technical support.

A business process begins with a mission objective and ends with achievement of the business objective. Process-oriented organisations break down the barriers of structural departments and try to avoid functional silos.

**Process Mapping:** Before we focus on improving efficiency of an organization, it should be first to know it, therefore first establishing a mapping process component of this organization in order to know how it works. According to [11]: "The mapping process of a business or an organization is a graphical way to restore identification processes and their interaction."

According to [6], the development of a processes mapping and control interfaces meet perfectly the requirements of the version 2000 of the ISO standard and can provide solutions to many questions. It is the basis of the identification of important processes, it is useful to prepare the internal audit programs, it assistance in setting up for measuring systems and monitoring processes and can be used to set implement improvement programs.

To map, it is useful to proceed as follows: [7]

- Present the mapping of production process and control process.
- Mapping the support process.
- Define the flow interface between these three mappings.

### 3.2 Business Models

The company is a complex structure. In order to better understand the operation, organization, resources and exchanged information in a company, today we need abstract but manipulated representations: models. To model, it represented the “reality” of an object or a system [3]. A business model is used to represent different views and aspects of it [4]. A business model is not static but existing research work on defining structured methodological approaches for business model evaluation is rather fragmented. Several tools, languages and standards to model certain views of the company have emerged.

With a few exceptions [4], most literature has taken a static perspective on business models, implicitly assuming them to remain stable over time. However, in reality organizations often have to reinvent their business model continuously to keep aligned with fast-changing environments in some sectors. As a result, instantiations of business model dynamics may be found in any component of the business model, such as redefining or extending the service concept, replacing technologies. The UML is used today to model certain views of the company. UML is not a method but a technical representation because it does not permit to know precisely what to model. This is according to the methodology.

### 3.3 A logical Service-Oriented Architecture (SOA)

The concept of SOA (Service Oriented Architecture) defines an architectural style based on the assembly services offered by the applications. In this architecture style, the various software components are connected by a loose coupling (services are independent one from another in order to change easily the order about their orchestration to form the process).

A "service" within the meaning of SOA, is a connection to an application, providing access to certain of its functionalities. The functions provided by a service can be treatments, information researches. For example, an application of customer management can offer a service returning the contact information of a client. In an SOA architecture, we are interested However, to several different aspects of designing an IS. The PIM4SOA project [8] defines four views to define SOA architecture:

- **Informational view**: the information is related to messages and business objects exchanged between services.
- **Process view**: the process described sequencing and coordination of services in terms of interaction and control flow of processes.
- **Service view**: services present an abstraction and an encapsulation functionality provided by an autonomously entity.
- **Quality of service view (QoS)**: is interested on other non-functional aspects such as: safety and performance of services.

These views involve a logical architecture. The implementation of a solution of urbanization need to rely on a technical platform. A model on a technical architecture must be used. This architecture must be a technology framework on which the logical model is projected.

### 3.4 Oriented Architecture Technology - ESB

Service Oriented Architecture (SOA) is implemented using an ESB (Enterprise Service Bus). This technology platform integration is now developed as part of ObjectWeb community through the Petals<sup>2</sup> project. In [9] an ESB is defined as a platform to manage the joint use of applications shared by the partners.

The control of processes associated with this partnership can also be provided through the bus and its workflow management tools. The bus plays finally the role of mediator between the partners performing the functions of connection and access management. ESB is primarily a tool of asynchronous exchange with standardized interfaces (SOAP, JMS...) or integrated (JBI...). It can also provide added value services (translation, processing ...) activated by events. Currently, the challenge is the construction of UML profiles as a technical architecture. Some works has been done in this Optical (PIM4SOA project) and a UML profile for SOA was performed [8].

## 4 Application Case

The National Fund of Social Insurance (CNAS) was created by Executive Decree No. 92-07 of January 4, 1992 to reorganize the social security system. Throughout the national territory, it is represented by CNAS agency. In terms of services, to each agency, are attached payment structures, named: Paying centers, which insured persons, are affiliated. The benefits provided for the reimbursement covers the following risks: *Sickness, Maternity, Disability, Accident and Occupational Disease and Death*.

The fund aims to modernize gradually its IS because the logistics hardware, human resources, programs training, rules, procedures and regulations, in a word, all the IS was mobilized to ensure the quality of the service provided against population of insured persons , which is the essence of the existence of an insurance fund.

It turns out that the current CNAS IS, is characterized by the availability of certain useful information, updated through the web portal, but do not provide information on its business results. A functional partitioning slowing making any decision was being noted on existing applications.

Lead the activity by focusing on business processes from the beginning to the end requires a cross approach beyond the borders of the departments. These processes involve multiple actors and systems, which are actually divided into different functional zones, but often interact in procedures belonging to the same chain of value of the company. This kind of management is that the fund intends to undertake, a mode which highlights the idea that the fund may be a business oriented enterprise.

Note the existence of two main components of the macro business processes of two branches of the functional fund namely:

- The recovery of dues through the population of employers.
- Benefits for reimbursement of the insured population.

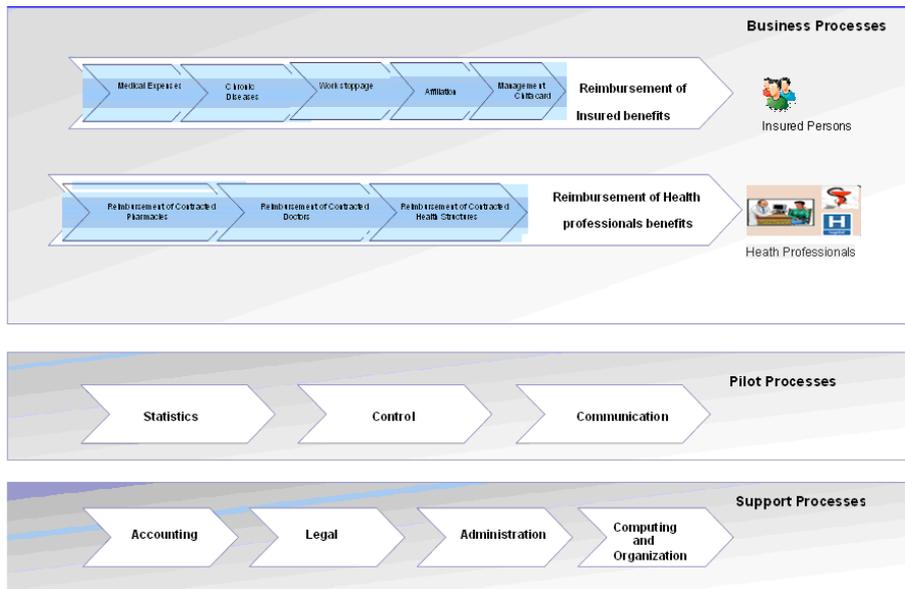
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<sup>2</sup> <http://petals.objectweb.org>

The latter is divided into two basic business processes:

- Reimbursement of medical expenses.
- Reimbursement of work stoppages.

Both of them represent the main business in payment structures of the fund. They include the following steps: control rights to benefits/services, liquidation, validation and payment of the file. A mapping of these processes is illustrated in (Fig.1).



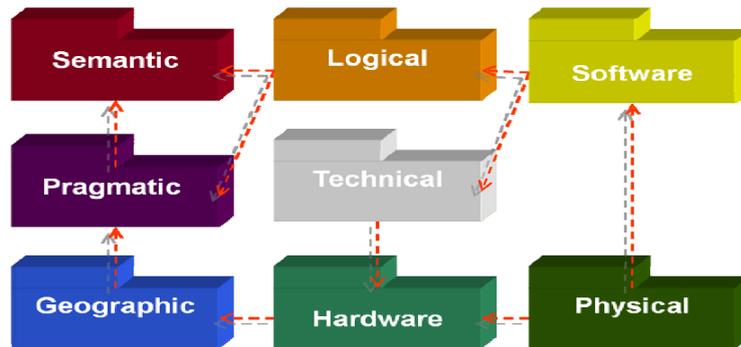
**Fig. 1.** Mapping of business processes relating to the operation of the fund.

In (Fig.1), all processes relating to the operation of the fund are mapped. Business processes include the macro processes: reimbursement of benefits for insured persons and health professionals. Pilot processes include statistics, control and communication. Supporting processes like accounting and legal.

However, we claim that rethinking the architecture of the IS can be done progressively. The business process “*Reimbursement of Medical Expenses*” was taken as pilot driver business process throughout the organization that accompanies because it is a major element in the right functioning of the fund. It is also a fundamental indicator to the services provided quality. And through it, the urbanization process of the fund is presented below.

## 5 Our Urbanization Approach

We adopt the **PRAXEME**<sup>3</sup> method in our process of urbanization. It is an enterprise methodology, which aims to be open public source, for design or redesign of IS, covering all aspects of the business from strategy to software development. To represent the company and embrace all angles of appreciation, the method is based on a diagram identifying and articulating eight aspects (Fig. 2).



**Fig. 2.** Enterprise System Topology [10]

The aspect or facet is a view where the system is seen as a type of particular concern. The aspect, which is a component of system, has a relative nature, it is linked to a point of view, a kind of concern, a specialization.

**Step 1:** (Semantic Aspect) in this step, the objects and concepts at the heart system are described. We express in this what phase is most stable in our IS. We to find the semantic class (object class), the informative properties (attributes), and active properties (operations), such as: Class of Insured persons in our case. The semantics business model is developed in terms of packages, modeled through diagrams: field, class, transition and states of UML. A data repository is designed, on the studied business.

**Step 2:** (Pragmatic Aspect) at this second stage, the actors of IS are delineated and then their types and functions. The pragmatic modeling will define the management style, command structure and operation in organizational entities, business processes and user profiles, such as business process studied in our case. In other words, in terms of use, it is to identify functional areas and in terms of organization, it is to identify the business processes.

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<sup>3</sup> [www.praxeme.org](http://www.praxeme.org)

**Step 3:** (Logical Aspect) the result of the previous two steps is projected on an SOA model. This last is compatible with the reference architecture in IBM's SOA [12]. The SOA model is composed of three layers:

- *SOA business layer*: is the business services component process “Reimbursement of Medical Expenses”.
- *SOA applicative logic layer*: consists of bus service with ESB Service Registry allows services to be published, sought and relied upon.
- *SOA component layer*: invokes the service components involved, which run at the server level where they are, the methods implemented by objects grouped in the components.

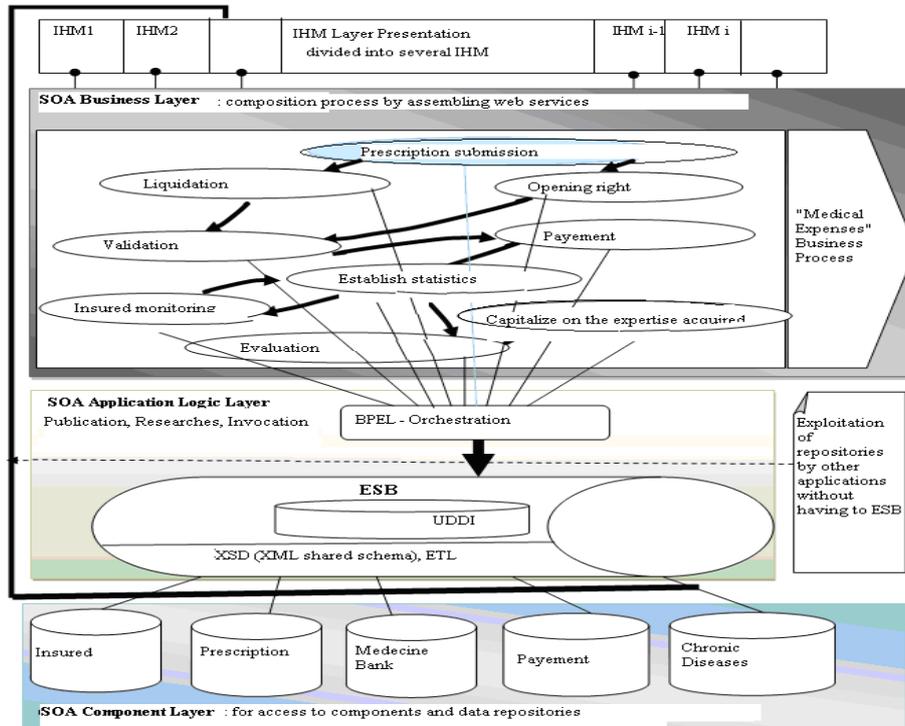
These are transcriptions by layer of semantic and pragmatic descriptions, transcriptions guided by the architectural structure rules.

**Step 4:** (Technical Aspect) in this step we move from an SOA logical model to an ESB technical model. For this we need to define a UML model for USB. This model will contain the basic elements that : define an ESB as that "Bus", "XML Message", "Directory services ", " service address ", etc.. The material aspect is closely related to the technical aspect because the choice of the hardware architecture used is set in this level.

**Step 5:** (Physical Aspect) in this step we focus on a transformation from a model to a text. The goal is generated from the ESB model set of text representations necessary for setup and the implementation of the ESB platform. We distinguish BPEL representation (Business Process Execution Language) for orchestration of services, XML representation for presenting messages exchanged between web services and structure, a representation of WSDL (Web Services Description Language) for describing web services, their addresses, and so on. . And thus set the rules for locating software components namely web services on the hardware architecture and the covering geographical aspect.

## 6 System Architecture

The IS architecture proposed below (Fig. 3) is a layered architecture, consistent with the SOA reference architecture of the IBM [12]. It distinguishes the business from the application, which the application architecture is an SOA implemented by the bus service (ESB) and packaged web service.



**Fig. 3.** Information System Architecture based on SOA

The business layer is the business services up our process “*Reimbursement of Medical Expenses*”. Business services invoke services made in the register of services via an orchestration calls through the engine process BPEL.

Once a service is called, in his turn invokes services affected components that run in the servers where they are located the implemented methods by the objects grouped in the components. The implementation is fully distributed, synchronization is provided by bus services features which is doted of the transport function.

The proposed architecture (Fig. 3) provides substantial improvement in IS of the fund to support the business processes studied by:

*Promoting agility:* because it allows structure in a dynamic relative IS. Indeed, any change that can be made on the process, in the future, is easily manageable, because of the separation between the business and application.

*Improving accessibility:* facilitate communication between the fund and other companies or partners such as health professionals, through the use of Web services. And thus ensures the sustainability of the business solution implemented.

The implementation is fully distributed, synchronization is provided by the bus services (ESB). Therefore, the proposed solution offers a significant time saving for any extension of the process itself or generalization of SOA to the other processes.

## 7 Conclusion

We have presented in this paper an urbanization approach of IS. This approach is oriented services. We are inspired by the Praxeme methodology with their different aspects in order to stop the steps for our approach. This was validated by the application of this approach to our practical case of the IS on the field of social insurance benefits, specifically business process: reimbursement of medical expenses.

The work of the methodological point of view could be a cornerstone in the edifice of opens development in a progressive business-oriented enterprise, such as: CNAS. Contributions of SOA application in this case, manifested themselves explicitly via the flexibility of its business processes and the opening of its IS about the outside world through the Web services exposed so that it can be interactive on the web and allow businesses, employers and insured persons to be contributors. In the near future, we intend to generalize the application of SOA in the enterprise, by its propagating on other processes, following the approach presented. Also, think about designing a specific ontology to the social insurance field that would be beneficial in the semantic aspect of our approach. The use of domain ontology can facilitate the reuse of information in the IS. Reuse is a strategic problem for reducing costs and improving methods of design and development in our IS. Finally, the combination of SOA and Web 2.0 could be a useful extension for our work and for all service oriented IS.

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