

# Using a Multi-Perspectives Approach for Building a Socio-Technical Information System

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Abstract: In this paper we propose an approach for developing Socio-Technical Information Systems - STIS with integrating social, business, and technical needs of an enterprise. As a first aim of our proposed approach is to ensure that both technical and human factors are given equal weight in the design process. As a second objective is to provide the right information at the right place and the right time and thereby enable communication between people, machine and computer, and their efficient cooperation and coordination. To build an STIS, we propose a multi-perspective approach based on 4 perspectives, namely: usage (resources) perspective, ESB perspective, business process modeling perspective, and SOA perspective. We use the Business Process Modeling Ontology in considering the different perspectives.

## 1 INTRODUCTION

When developing an information system, we need adequate underlying enterprise models that would help appropriately considering the real-life business context in which the information system would have to operate. This challenge is being addressed by numerous researchers whose efforts have been inspired by the goal of closing the gap between enterprise modeling and software design. Enterprises have to become agile, sensitive to changes in market forces, and capable of responding with incremental modifications in business and services provided (adaptation) as well anticipating radical changes by responding with new and breakthrough business models (innovation).

Recent trends in the development of information systems are associated with intention to consider the social system and the technical system with equal weight.

On the one hand, the need of integrating enterprise systems and technical systems calls for novel ICT framework models and solutions, such as “EIS” - *Enterprise Information Systems* which refer to organizational implementations of commercial software packages that enable the integration of transaction-oriented data and business processes through an organization (Markus and Tanis, 1999). But to date there is a wrong understanding of those systems. The prominent current idea is that an

enterprise information system is a product like for example a car (Dietz, 2014). We aim at re-established people who work on the enterprise as the ‘parts’ of every organization. They deliver services to each other and to the environmental actors through transactions. Those transactions are generally represented through business models which describe the rationale of how an organization creates, delivers, and captures value.

Our main objective in this paper is to propose a Socio-Technical Information System approach – STIS, which integrates the social, business, and technical needs of an enterprise. As a first aim of our proposed STIS is to ensure that both technical and human factors should whenever possible be given equal weight in the design process. As a second objective is to provide the right information at the right place and the right time, and thereby enable communication between people, machine and computer and their efficient cooperation and coordination. (Mumford, 2006). A socio-technical system differs from other types of systems in that it has human participants performing essential tasks inside the system. However, as any other system, a socio-technical system can be modeled as consisting of a number of components interacting with each other, and the system’s environment.

A socio-technical system is considered as composed of two sub-systems: a technical system and social system. The technical sub-system encompasses

both technology and processes. The social sub-system encompasses the people who are directly involved in the information system's structure in which they are embedded (Rabah Imache, 2012).

Our STIS approach is in line with the Service-Oriented Architecture – SOA (Rafati, 2013).

To build an STIS, we propose a multi-perspective approach based on a usage (resources) perspective, a business process modeling perspective, a SOA perspective, and an integration perspective. We use the Business Process Modeling Ontology – BPMO, in considering the different perspectives. In Section 2 of this article, we will present the proposed approach and we will give more details about the four mentioned perspectives, and also about the role of BPMO. In Section 3, we will illustrate the technical architecture for building an STIS, based on SOA and Enterprise-Service-Bus technologies. And we conclude the article with the conclusion.

## 2 PROPOSED APPROACH

We start with the business process modeling perspective which is considered essential. As presented by (Chen, 2012) a business process consists of workflows which are a series of interested tasks with data flowing and processing. It can be a person-to-person, person-to-system, system-to-system or a combination of three. Business modeling is not only about the business processes but also about the construction that concerns the business strategy and the design of organizational structures. The strategy formulation is based on resources and capabilities. The Object Management Group – OMG propose the Business Process Modeling Notation - the BPMN 2.0 standard to support business process modeling (Chinosi and Trombetta, 2012). Although the syntax of BPMN is clearly defined, semantics is not (Guedria, 2014). Since 2008, the OMG have tried to solve this problem, by the defining “semantics of business vocabulary and business rules” (SRVR) (OMG 2008).

We argue that business process management requires a comprehensive integration among a variety of systems and services. Many authors have noticed the importance of business aspects of Enterprise Integration (Li and Williams, 2004) and have tried to use it when building a business process model.

Vernadat (1996) gave his definition as follows: “Enterprise integration is concerned with facilitating information, control and material flows across organization boundaries by connecting all the necessary functions and heterogeneous functional

entities (information system, devices, applications and people) in order to improve communication, cooperation and coordination with this enterprise so that the enterprise behaves as an integrated whole, therefore enhancing its overall productivity, flexibility and capacity for management of change”.

In 2003, the needs for physical connectivity in the area of enterprises have grown into a much bigger and richer perspective, Enterprise Interoperability (EI), which is about both information and functionality sharing between concerned parties (Vernadat, 2003).

We consider SOA as an integrated enterprise model which can be applied to transform an enterprise model to a flexible one in order to respond to several important trends such as globalization (Rafati, 2013).

We hope also to consider the role, competences and needs of the human resources who are concerned with the integration model. That's why we consider a usage perspective called also use resources perspective. We consider this perspective as important in building an STSI. We illustrate in Figure 1, the concept of actor which is defined as an organizational unit with expressible and collective knowledge, and have competences that reflect the implementation of this knowledge in an operational context, and assigned to a role within a business process (Jabloun Marwen; Sayeb Yemna, 2013).

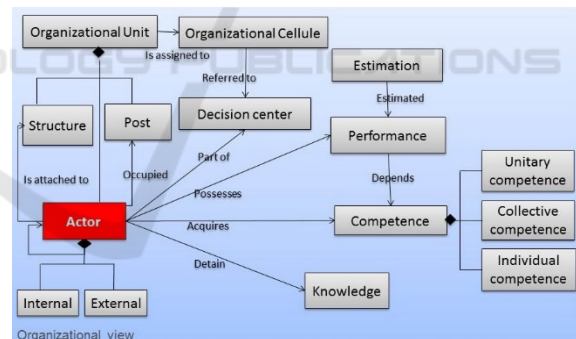


Figure 1: The use resources perspective.

So, to take into account all those perspectives: web services integration and use resources, we use BPMO. The business process modeling ontology is part of an approach to modeling business processes at the semantic level (Lalehrafati, 2013), integrating knowledge about the organizational context, workflow activates, and semantics.

BPMO describes a rich business process model, as demanded by the Business Process Management Community, using ontological descriptions to capture workflow and organisational concerns in a uniform and extensible manner, and reuses the results of

Semantic-Web-Services –related research for the description of interaction activities. There are various advantages for using BPMO. As explained in (Cabral and Liliana, 2009): Firstly, BPMO provides comprehensive semantic annotations for business processes that can be used for automated inference at the business level while facilitating the translation to the execution level. Secondly, BPMO provides links from the process to organisational aspects, which can be modeled independently for different domains. Thirdly, BPMO can be used to verify at the semantic-level restrictions applied to the workflow or certain process activities. Finally, BPMO facilitates the modeling of new (or mediation) processes, based on existing ones as well as the discovery of services for goal-based activities.

The four perspectives for building an STIS are depicted in Figure 2.

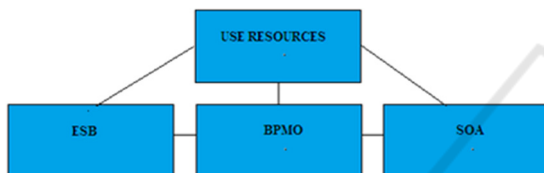


Figure 2: The four perspectives for building an STIS.

### 3 IMPLEMENTATION

SOA, considered with regard to the implementation, proposes an integrated model based on a central registry which is called broker (Chen, 2012). SOA makes the integration process easier as it would not require software re-development.

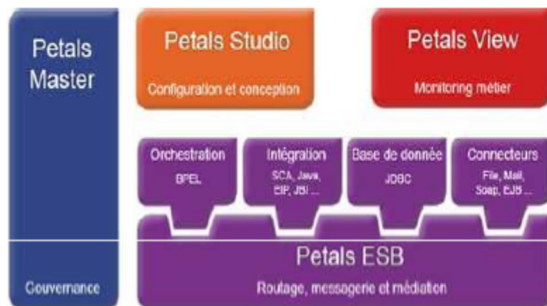


Figure 3: Petals Environment.

Enterprise Service Bus - ESB is a bus architectural technology to connect many disparate systems and services together. It is organised on set of service containers inter-connected over message-based bus. The ESB technology, based on SOA, improves the central registry mechanism of SOA to service

containers architectures. So we decide to experiment the Petals SOA which is a set of tools providing a complete range of software to create, manage and monitor enterprise SOA solutions. *Petals* propose a context and role management through its containers. As illustrated in Figure 3, all tools adhere to open standards and proven use, robust, high performance technologies.

### 4 CONCLUSION

In this paper we have proposed a multi-perspective approach for building a socio-technical information system (STIS). Our objective was to use the Business Process Modeling Ontology (BPMO) in considering the different perspectives. BPMO describes a rich business process model using ontological descriptions to capture workflow and organisational concerns in a uniform and extensible manner. To implement our approach, we use the Petal ESB environment.

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