



Plural: A decentralized business process modeling method

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ABSTRACT

Top-down and centralized approaches prevail in the design and improvement of business processes. However, centralized structures pose difficulties for organizations in adapting to a rapidly changing business environment. Here we present the Plural method which can be used to guide organizations in performing process modeling in a decentralized way. Instead of a centralized group of people understanding, modeling and improving processes, our method allows individuals to model and improve their own processes to help in fulfilling their roles in the organization. An individual model depicts a set of activities performed by a role, which together result in a cohesive service within the organization. These individual models are then integrated as necessary to show the way the organization works. We applied the Plural method in a case study of a small-size software organization. We describe the method and its underlying principles and then discuss the findings of our case study, lessons learned, and limitations. The study thus provided evidence of Plural's utility and showed how an organization might exploit its strengths.

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1. Introduction

Organizations use process models to understand, analyze, and communicate organizational knowledge as well as a stepping-stone in automating their processing. We use process modeling in establishing quality manuals, assessing and identifying added value, establishing control mechanisms, and automating workflow. Consequently, process models are considered to be one of the most valuable assets of an organization.

Process modeling is traditionally performed as a top-down centralized approach. That is, a group of experts (systems or process engineering groups), work with groups of individuals (system users) in different roles to identify and record the business processes. As the degree of the involvement of the process performers in the modeling effort increases, the likelihood that the model reflects the actual processes as well as the likelihood that the group enjoys using the model increases. Therefore, the degree of their involvement is most critical in determining the success of their efforts. We hypothesize that the full advantage of involvement is obtained when the individuals model their own processes.

The cycle times of top-down centralized organizational process modeling projects can be in the order of months or years, or even decades for very large systems. Furthermore, once process definitions are considered stable it is often difficult to change

them. However, to respond to the demand of markets, organizations should be able to change their way of working. Thus we need to reduce the cycle time for modeling and improvement to the order of days or weeks. Process infrastructure should be able to incorporate changes rapidly. We believe that this goal could be achieved by a decentralized modeling approach.

Decentralized process modeling presumes each individual can define and maintain his or her own activities. If people model their own processes, they identify and resolve inconsistencies among their definitions. Such partial definitions, which are also maintained in a decentralized manner, can then be integrated to show the overall business processes and the organization's process network at a point in time. One of the significant challenges of this approach is that the resultant partial models possess any inconsistencies due to different people's concept of the overall process. However, we consider this an opportunity to allow an organization to identify points where improvements are possible in the overall process. This suggests that inconsistency resolution can be performed by the process performers rather than a central group who do not necessarily understand the problems or by an automated task executed by the IS. Shifting the responsibility to the knowledge workers improves the communication between them and uncovers implicit assumptions about the way the processes are carried out.

Decentralization in process modeling also allows process change to be performed by the process users on their own (individual) model rather than a central group maintaining organization's overall system. This helps by increasing employee

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involvement, which fosters problem solving and process improvement. Participation and commitment allow employees to make decisions and this makes it possible to reorganize rapidly to change, creating an environment of ownership [3]. This aligns with the shift from command-and-control to coordinate-and-cultivate with decentralized structures of loose hierarchies and democracies centered around enduring human values.

We developed a method, *Plural*, which provides a guideline for organizations to perform business process modeling in a decentralized way; it allows each process owner to take the responsibility of describing and improving his or her own process without any central control structure, but builds and maintains the organization's process-base.

During the development of the *Plural* method, we performed a number of pilot studies and applied case scenarios to explore the applicability of the method and enhance its structure. The intent was to answer the research question:

“What benefits can organizations gain from applying the *Plural* method of modeling their processes in a decentralized manner?”

Using the *Plural* method, diagrams depicting process dependencies and role dependencies were generated in order to provide insight into the way the organization works and can be improved.

2. Related work

Most of the business process management approaches assume central specification and enactment of processes (e.g., [2,11,14]). In general, such a structure provides functionality for process modeling and a software engine runs the models, records execution, and supports task automation and tool integration as necessary. The same assumption also prevailing in process redesign/improvement approaches. However, a centralized framework entails difficulties in knowledge-based organizations. It limits the degree of involvement of the process owners in the modeling and improvement efforts and makes it more difficult for them to own and maintain the definition.

Having recognized the importance of the involvement of the system users in process modeling, approaches urge organizations to motivate and encourage their employees in taking part in their definition and improvement projects [1]. Process modeling thus becomes a necessary skill for people in order for them to have a better understanding of the models and know how to evaluate alternatives. However, there is a lack of mechanisms and methods to help achieve process modeling in a decentralized manner. Studies on capturing process knowledge from different perspectives (e.g., a view-based approach for process elicitation [5]) support process model definitions at individual levels but assume a central structure in charge of eliciting and modeling processes, identifying and resolving inconsistencies between partial models, and integrating them.

Methods grounded on role-based modeling (e.g., Riva method and role activity diagrams, or formal enterprise modeling based on roles [9]) provide a conceptual description of a system. These methods offer proven approaches for specifying processes and systems in terms of roles and their interaction, providing a mechanism to capture individuals' behavior in the organization. With extensions, these notations can be utilized for decentralized process modeling. A decentralized structure should be in place not only for the elicitation and modeling phases but also for all other phases.

Singh et al. [15] proposed a commitment-based SOA that represents each participant as an agent that interacts and carries out a (business) service function through creating and manipulating

commitments to one another. It offers flexibility to the participant in their local behavior provided that their interaction protocols are not violated. This approach dealt with the execution aspects of business processes rather than their elicitation, analysis, and modeling, which involve executable processes or components (as opposed to a conceptual model).

3. The *Plural* method

3.1. Core concepts

The decentralized approach allows each participant in the organization to define a (partial) model of his or her domain. These models are integrated as necessary to define the overall organizational processes. The complete representation is derived by joining the individual models that were (independently) described. However, the effort is more effective if, at the start of the definition, the goal, objectives and scope of what is to be modeled is communicated and accepted by all parties. This sets the goal and boundaries without directing what is to be done locally by each participant (agent). Thus each employee is given full responsibility to define the services/operations he or she is responsible to provide and how it interacts with others (communicating and negotiating with them).

The relationships between agents and processes depend on the agents' roles. The operations to be fulfilled by the roles, when composed with other operations, make up the process. Fig. 1 shows the conceptual relationship between processes, roles, operations, and agents.

Although most businesses work in an *ad hoc* manner where work is completed with no high-level knowledge of how, an agent is provided with (or gathers) necessary resources and inputs needed to perform the activities and produce outputs. The *Plural* method captures and articulates this knowledge by requiring each agent to state his or her inputs and necessary resources. They must also define the outputs and their roles in obtaining the inputs and forwarding the outputs to another agent. As these expectations are defined by all agents they will be either fulfilled or renounced and all information passing through the interfaces is collected and analyzed. This therefore defines the interaction protocol between roles and defines their commitments.

The *Plural* method presumes that a dependency is a precondition for an activity to be performed. Thus an agent will be notified whether a precondition is or is not satisfied. The message can also include a notification about the state of a business object in the environment. Thus, an agent can receive a message indicating that a report is ready or it can receive the report itself.

Fig. 2 shows an abstract example of an individual process description of a role (role A). It displays how an agent's role represents the activities it performs within the scope of a specific service it provides and its expectations from others.

To use the *Plural* method, an organization goes through three phases that establish its process-base. Fig. 3 shows these phases and the information flow between them.

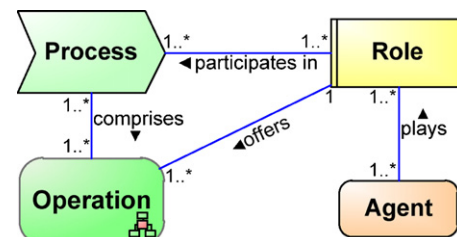


Fig. 1. Relationship between processes, roles, operations, and agents.

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