Modeling Organizational Actors and Business Processes

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ABSTRACT
Finding suitable actors to perform specific activities is a common problem in knowledge-oriented organizations. To address this problem, this paper outlines the concepts required to represent organizational actor’s skills and the services that are required by business process activities. These concepts are used within a marketplace-based model that enables dynamically managing actors and activities according to competence supply and demand.

Categories and Subject Descriptors
H.1.0 [Models and Principles]: General
I.6.5. [Simulation and Modeling]: Model development

Keywords
Skill management, competence, actor, business process modeling.

1. INTRODUCTION
Human resource and skill management have become an object of growing interest as their importance is recognized from a strategic perspective. Skill-based management intends to leverage the competitive advantage of knowledge-based organizations by considering individuals as strategic assets and by explicitly integrating them into the organization’s business strategy and processes. This has lead to the development of several methods and systems, often coming from knowledge management related studies [4,6,7,15]. Skill management systems play a role in different organizational activities, such as expert finding, personnel recruitment, personnel development and project management. These traditionally involve human judgment in classifying skills held by workers, evaluating the degree of competence and keeping up-to-date workers profiles. To facilitate the management of competencies and to minimize the subjectivity of human evaluation, several approaches put forward the use of information technologies to facilitate tasks such as facilitating and contextualizing the communication between actors [5], managing skills and activities within teams [12] and using groupware to support information sharing [13].

However, most of these solutions focus on supporting the operational phases of a business process and few assist the identification and selection of actors before the actual commitment to carry out its activities. This operational focus also means that skill management systems often do not relate the skill information pertaining to the actors to the activities’ requirements as derived from the organization’s process models. As a matter of fact, several business process modeling languages, such as the BPMN [2], IDEF-3 [14], Event-Process Chains [1] and Role-Activity Diagrams [8], focus on modeling business processes from different perspectives, such as activity coordination and business resource modeling, but lack the permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

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means to describe the skills required by the activities and those provided by the organizational actors. Consequently, the information on the organization’s skills cannot be directly traced to the business processes. This approach hinders skill management from a process perspective and promotes the existence of mismatches within the enterprise architecture description.

The remainder of this paper outlines a framework to overcome the issues above described extending previous work on business process and actor modeling [2,8,11] with a set of concepts that allow representing and evaluating actors and competences in the context of business processes.

2. MODELING ACTORS AND PROCESSES
Competency modeling primarily addresses two concerns: the representation of the services provided by organizational actors and those required by activities, and supporting the dynamic management of competences, thus assisting actor scheduling and team formation.

2.1 Representing Competences
Competences facilitate the description of services that are derived from a set of characteristics pertaining to each organizational actor. These services are available to support activity execution. In turn, activities require specific services provided by actors in order to produce business value. Thus, competences enable assessing the alignment between actors and activities from an organizational standpoint.

Figure 1. Elementary structures (left). Competency definition (right).

Competences classify human actors according to their ability of performing tasks in a specific environment. They are the manifestation of knowledge attained through the performance of an action. A competence is defined through the aggregation of elementary concepts, namely nouns and verbs (e.g. “coding a breadth first search algorithm in Lisp”, “coding a web service in C#”). As expected, the same concepts may be used to define unrelated competences. The concepts may also be related or functionally dependent (e.g. Lisp and C# are both programming languages although dealing with different programming paradigms). To represent such features, we define a set of layered hierarchic structures that functionally specify the competence’s concepts regardless of their usage context. In Figure 1, a competence is defined by the tuple (A, B, B, C) which results from association of the corresponding elementary concepts nodes. This type of structure allows concepts to be uniformly reused while defining different isolated competences.

However, actors and activities are related to a number of competences whose meaning depends on their usage context. Besides, these individual competences may be structurally related. To represent such structure, competences are aggregated as coherent groups.
comprising individual competences. Figure 2 describes four hierarchically aggregated competences, C₁, C₂, C₃, and C₄. Each of these individual competences arises from the association of several concept nodes (e.g., C₁ is defined by the tuple (A₁, A₂, B₁, C₁)).

Separating the aggregation of competences from their definition enables the flexible rearrangement of competences according to usage context without disrupting the corresponding definition.

Groups of aggregated competences can then be bound to the organizational actors and activities, thus specifying the potential supply and demand of competences within the organization.

2.2 Actor Scheduling

The primary goal of representing competence supply and demand is allowing an organization to find, schedule, and manage suitable actors or teams of actors to perform instances of activities. Our approach follows the general steps behind a marketplace transaction. This facilitates the management and tracking of competences from an organizational perspective while promoting actors to develop their competences. It also facilitates correcting and analyzing the mismatch between the actual requirements of an activity and those specified in the business process models.

The purpose of the first step is allowing the demand side (activities) to find potential suppliers (actors). This is accomplished by searching the supply representations using inference and propagation mechanisms on the hierarchical competence structures. The result is a set of actors and the corresponding quantitative evaluations computed from the similarity between the required and provided competences. These results must then be categorized according to the existing scheduling plans that track the assignment of actors to activities, thus limiting their availability. The results also need to consider existing business rules that may constraint the scheduling (e.g., competence C must be exactly provided; actor A and B cannot participate in the same activity) and the type of results (e.g., the result must be a single actor). The information resulting from this step may be used to automatically propose a team or to assist a human-based team formation process.

The second step, team formation, corresponds to the negotiation phase between the transaction participants. Here, each individual actor, the team as a whole and the activity owner settle the contract details, making explicit the assignment and scheduling terms and conditions. Finally, a contract is defined after the negotiation phase is complete, specifying the team and scheduling details, thus binding actors to an activity through their competences.

Implementing the contract means performing the activity’s tasks. The execution phase can be evaluated while active and a posteriori using a set of metrics whose goals are measuring how the contract was carried out by each individual actor and by the team and providing feedback on the alignment between supply and demand.

3. CONCLUSIONS AND FUTURE WORK

The concept of competence is a fundamental to align actors and activities within business process. It enables an organization to understand and evaluate what is actually required by its processes and what is provided by its actors. It also provides a means to make competences visible to all process stakeholders, including its performers, designers and owners, allowing mismatches to be identified and continually adjusted. Provided the different stakeholders see the benefit of accurately representing the competences they are responsible for, the marketplace will converge to a state that represents the actual supply and demand of competences within the organization.

We have developed a web-based system that implements the concepts outlined in this paper, which is currently being evaluated in real organizations in order to validate the approach. It allows employees to represent and advertise their competences and process owners and designers to specify activity requirements and evaluate the performance of actors. The system also supports the dynamic aspects of actor scheduling, allowing for the search of competencies, assisting the process of team formation and evaluating the scheduling results.

We are currently extending the framework to include the representation of the services provided by non-human actors, including information systems and other business process support systems. The goal is to unify the representation of the services supplied by human and those supplied by system actors. This will enable defining alignment metrics between the organization’s service providers and its business processes.

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