Towards a Unifying Process Framework for Services Knowledge Management

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Abstract. Activities concerned with the design, planning and execution of services are becoming increasingly complex. This is due to the involvement of many different stakeholders, the complexity of the service systems themselves, and the dynamic nature of their organizational and ICT environments. Service knowledge management helps share and reuse relevant knowledge among the different stakeholders, and therefore emerges as a critical factor to perform service activities with required efficiency and quality. Recent advances in knowledge management provide promising opportunities to support individual service activities within a single domain. Yet, sharing knowledge throughout the service life-cycle and across service domains is still very challenging. The source of service knowledge, its usage, update frequency, encoding and associated stakeholders may vary depending upon the service activity and the service domain. Based on a critical analysis of currently proposed frameworks, we argue that a process framework approach is beneficial for service knowledge management. To support our claim, we offer an abstract template and a typical service life-cycle that can be adopted to integrate heterogeneous service knowledge from diverse sources.

Keywords: Unified Process, Process Framework, Knowledge Management Framework, Service Life-cycle, Service Knowledge Management

1 Introduction

Services are playing an important role in our current economies. In general, experts from different disciplines are involved in the various service activities, such as the design, planning, offering, execution and regulation of services. Knowledge management throughout the service life-cycle and across service domains becomes very challenging with the increasing complexity of these service activities and with particular terminology, semantics, artifacts, information sources, analytical methods and decision tools for each activity and from each domain. Depending on the service activity and the service domain, experts may engage in knowledge creation using different environments with different update frequency, system support, encoding and usage scenarios. Consequently, the integration, management and provisioning of such knowledge is hard to achieve. This is particularly the case for small enterprises that would prefer to reuse available knowledge. This calls for a knowledge management

strategy that allows the creation, sharing and reuse of service knowledge in interoperable, collaborative and dynamic environments.

2 Service knowledge management requirement

Based on our observations from the literature, we conclude that only service knowledge management frameworks being proposed. A framework is a research tool employed to identify general concepts of a field of enquiry along with inter-relations among them[1]. The Activity Based Framework for Services (ABFS) is a framework being proposed to support integration of multi-disciplinary work in the service science community [1]. In this work, services are seen as processes with various actors and attributes. The Service System Framework[2] is a similar effort, which characterizes services under a systems view. In [3], a discipline-by-life-cycle matrix is proposed for identifying professional skills requirements during the entire service life-cycle. TRIZ[4]. is an example of an existing framework, employed to aid in services innovation by applying the 40 TRIZ principles The Zachman framework has been used to consider service description and service engineering in the enterprise architecture viewpoint in [5] and [6] respectively. Finally, combined advances in semantic web and knowledge management approaches provide a strong basis for collaboration and reuse. For example, emerging results in semantic web and knowledge management can be used as a basis for a knowledge management framework in the health domain [7].

By studying of these ongoing efforts towards service knowledge management we identified some knowledge integration issues. Each framework is proposed to meet the need of a special discipline or domain. In case, knowledge sources from different disciplines and domains are integrated in a single knowledge repository, disambiguation of some terms is necessary to create a unified logical namespace. Identification and establishment of multi-disciplinary indicators and criteria for this disambiguation activity may require consensus among contributors. Comprehensive coverage of the complete service life-cycle is highly desirable. This can be particularly challenging as the knowledge management framework should not only act as a repository of heterogeneous knowledge artifacts, but should ensure complete tractability, configurability, extensibility and coverage, so that it can be reused in different dynamic collaborative environments.

3 Salient features of a process framework

Process frameworks have been extensively used by the software development community in dynamic collaborative team environments. Rational Unified Process (RUP) is an example of a widely accepted process framework [8]. A process framework is employed as an integrative tool for defining various actors, their attributes, skills, activities, outcomes and related information. It provides guidance in the form of checklists, white papers, concept definitions, tool mentors and related references to aid the activity. As an important feature, it also helps document the work

distribution in the form of work breakdown structures. Identified tasks are grouped to form disciplines, identified work products are grouped to form domains, and, identified work breakdown structures are grouped to form capability patterns [9]. In this manner it integrates various elements involved in different phases of the software development life-cycle. Once the process is well defined, the individual teams can utilize required process subsets or the entire process and also may customize these to meet individual requirements.

4 Proposal

Considering the reusability and the integrative capability of a process framework, we are investigating its applicability to the service knowledge management problem. The RUP has already been extended to support the development of computational services according to the Service-Oriented Architecture (SOA) paradigm in [10]. Table 1 identifies service knowledge elements that are often found in the literature on services science [1-6], process framework elements identified in [8-10], and the possible mappings between these elements.

Table 1 Mapping between service knowledge elements process framework elements.

	Service knowledge elements	**Process framework elements**
1	Actor (Stakeholder), Skill	Role, Role set
2	Process	Task, Discipline
3	Service Life-cycle phase	Capability pattern, Delivery process
4	Value, experience	Work product, Domain
5	Technology support	Tool mentor
6	Recommendation	Guidance, Checklist, Templates, etc.
7	Traceability	Process editor / viewer / IDE
8	Customization	Process authoring/custom fragment

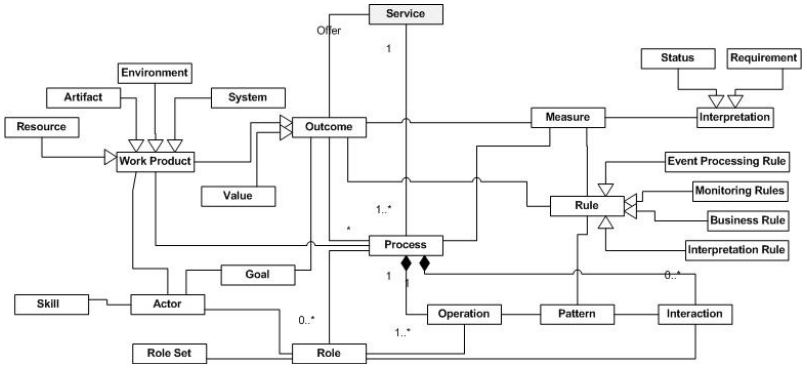

Fig. 1. Typical service elements

Employing the concept of framework in a service knowledge context, we selected the most salient service knowledge elements and defined how each of them is related to other service elements in the abstract model depicted in Figure 1. A service process is associated to operations, roles, outcomes, and work products. Each service process can be evaluated by some measure and may be governed by some business rule. Work products of a service process can be of many forms as defined in a typical process framework. Such elements can be identified for all processes in various phases of service life-cycle. A typical service life-cycle may include phases like service identification, requirements and analysis, knowledge management, planning, configuration, execution, monitoring, analysis, control, governance, upgrade, promotion and innovation. Figure 2 depicts the logical progression of life-cycle phases for a service instance that we are considering in our work. Depending upon the nature of the service and decisions of related stakeholders, the service instance may exhibit different stages and iterations.

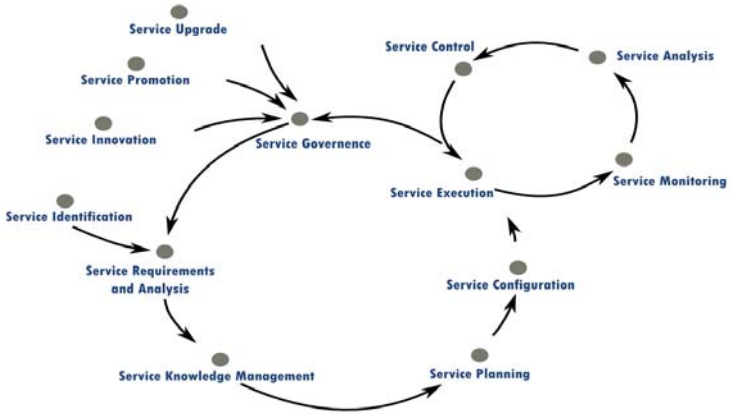

Fig. 2. Typical service life-cycle

5 Discussion

Elements depicted in Figure 1 can be identified for each phase of the service life-cycle depicted in Figure 2. For example, the knowledge encoding can be carried out using a process authoring tool. Eclipse Processing Framework (EPF) [9] is an open source tool that can be used for this, while the Rational Method Composer (RMC) is a commercial tool widely employed to author and share a process with additional capabilities to integrate with software development tools and environments. We argue that these capabilities can help support service knowledge management. Work products like service blueprints, governance policies, and similar documents are knowledge artifacts that can be created, shared and reused among service instances. The process framework enables the integration of these artifacts as guidance and can associate them with specific process stakeholders and their work environments. The stakeholders can reuse relevant shared processes or fragments and can also author

customized processes according to their requirements. In this manner, this approach is advantageous over other approaches where integration of heterogeneous knowledge forms is difficult due to various representational constraints.

6 Conclusion

In this paper we characterize the challenging problem of knowledge management in complex service systems. We studied ongoing research efforts that address this problem and identified some common limitations of these efforts. We investigated the suitability of a process framework for multi-disciplinary service knowledge management. To support our suitability claim, we identified mappings between common elements of service knowledge and elements of a process framework, and we presented a typical service life-cycle. Our current efforts are on the development of method plug-ins to cover a generic service life-cycle. The future work will aim at integration of discipline-specific tools and environments according to appropriate method content.

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