Three lines of research for ontology and ontological engineering in service science

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Abstract. This position paper attempts to sketch three lines of research in ontology and ontological engineering for service science. They concern the development of:

1. a general ontological approach to services
2. the ontological treatment of service contextualisation
3. a unified approach to Web-based service provisioning

A general ontological approach to services

A first line of research, which is perhaps the central one, regarding the application of an ontological approach to service science is that of the development of a general ontological investigation centered on services. Here 'general' means that the approach asks primarily the following questions: what is a service? Are there different kinds of services? What are the main categories, relations and roles that an ontology focused on services should include? Does the answer to the previous question depend on specific kinds of services or what are the commonalities? Provided a service is seen as a unit, what wholes does it enter in (e.g. Service Value Networks) and what are the characteristics along which formation of complexes is significant?

A service has a strange kind of being. On the one hand, it exists potentially, on the other hand it exists in processes realising this potential. A service involves participant roles (agents such as providers, benefactors and intermediaries but also resources) for processes leading to the service realisation. Thus a general theory of services has to account for the internal structure of services and the relations to the surrounding categories of entities involved in accounting for services. It has moreover to account for the distinction between a service in abstracto and a service in its realisation.

Aside from the fact that services are complex in that they involve many participants and relate in their execution to surrounding processes, services can be related with other services and aggregated or composed in complex services. Thus, a general theory of services needs the tool, such as for example a mereology, for dealing with such complexes.

Finally, in addition to the core structure and the surrounding characteristics of services, there are a number of added characteristics which are not definitional of services and enjoy a rather open ended and variable range of determination.

Value, for example, is of this sort. Thus there is a need for fleshing out the tools allowing for the expression of added characteristics and their sorts.

The ontological approach is both one that ask these questions at the level of philosophical ontology, with an ontological investigation of what services are in the world and what are the formal structures that allow to account for a theory of them. This ought to result in a formalisation which ought to lead to machine processable representation. This line of work follows the general thrust towards carving a general ontological theory of services in the recent work of Ferrario and Guarino.

The ontological treatment of service contextualisation

Another line of research is concerned with an ontological treatment of the contextualisation of services. 'Context' is by and large a buzzword but it can be put to use in two ways relevant to a general approach to services. The first comes from the insight that services and their descriptions are sensitive to the sort of activities in which they occur. A credible working assumption is that services occur under different perspectives depending on the task that agents are intending to carry out such as, for example, search, provision or monitoring. Thus, it is important to identify and characterise the range of activities in which services take part as components of larger processes. This allows defining a notion of kinds of contexts for services. A second related way in which the general approach to services can be pursued is concerned with all the elements that are not functionally essential to services, to their offer or delivery. Concrete realisations of services with their different modalities are tied to the specific nature of surrounding tasks but also of the actors involved, the resources used, the output created and sometimes the values exchanged. The constellation of such non-essential parameters can be used to define a useful notion of context.

There are then two kinds of contexts: i) the processual context which gives sense to a core service oriented process and ii) the participant context (including agents and resources) which further specifies the sense of service processes in relation to its core participants. These two notions allow for a general ontological treatment of services and to develop the formal structure for accounting for their contextualisation. Also, this basis allows identifying the elements for fleshing out the kinds of entity that are contextually relevant to particular kinds of services such as, for example, IT infrastructure in relation to service delivery in a mobile computing environment and the modalities of transaction tied to a service.

A unified approach to Web-based service provisioning

Finally, a third line of research resides in the unification of the business and economic notion of service and the way services so conceived are increasingly deployed over the Web. The principal question is that of the relationships between services and software that support their Web-base delivery (Web services) and the tasks that surround them. At stake is, in particular, the possibility of

enhancing the semantic description of Web services with non-technical and non-functional descriptions relating to their role in the delivery of a service in the economic sense. It is a mischaracterisation of Web services to count them as services in a sense that is not exclusively that of information technology. Nevertheless, there is a genuine association between Web services and services which is of the sort there is between a service and participants in its realisation. In that respect, the link between Web service execution (and related tasks) and service provision (and related tasks) ought to be given a rigorous ontological elucidation. Benefits from such investigation arise for both worlds and their interconnection on the Internet.