Demand-Driven Development of Service Compositions in Organizational Networks

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ABSTRACT
Organizational collaborate more and more in organizational networks to remain competitive. New systems can be created by assembling a set of elementary services provided by various organizations. Several composition methods are available, yet these methods are not adopted in practice as they are primarily supply-driven and cannot deal the complex characteristics of organizational networks. In this paper, the authors present a service composition development method and a quasi-experiment to evaluate this method by comparing it with existing ones. The development method is able to deal with incomplete information, to take the demand as a starting point, to deal with new services that do not exist yet, to include and to evaluate non-functional requirements, to show various stakeholder views, and to help to create a shared vision. Visualization and evaluation of alternative compositions and negotiation about the desired results are important functions of any composition method in organizational networks.

Keywords: Composition Methods, Organizational Networks, Service Composition, Socio-Technical Systems, Web Services

INTRODUCTION
Organizations are more and more forced to collaborate with each other (Chiu, Cheung, & Zhuang, 2010), share information and reuse system components to reduce cost. The creation in organizational networks results in the creation of flows that are no longer self-contained within a single organization. The performance depends more and more on the performance of external partners that are often unknown. Whereas in the past each organization has developed applications independently of other organizations, the current development is to develop components only once and reuse them as services in the organizational network (Janssen & Joha, 2008). This has resulted into the trend of creating new systems as composites of web services (Liang, Huang, & Chuang, 2007). Web services technologies promise to create new business applications by composing existing services and to publish these applications as

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services for further composition (Liu et al., 2010). This is known as web service composition or composition for short. A composition combines a set of web services following a certain composition pattern to achieve a certain objective (Curbera, Khalaf, Mukhi, Tai, & Weerwarana, 2003). Web services are self-contained, self-describing software modules that can be published, and remotely invoked and in this way reused (Fremantle, Weerwarana, & Khalaf, 2002). An example of a composition is the buying or selling of travel insurances. There can be a service for checking the identity, for adding the required information, calculating the costs of an insurance policy, and for financial settlement and payment. Such compositions are synthesized by the reuse of elementary web services. It is not hard to imagine that many of these services can be re-used for all kind of other (insurance) products. Yet, the benefits of reusing information and functionality have not been attained as creating service composition is a difficult endeavor (Feenstra, Janssen, & Wagenaar, 2007). Services are often not developed for reuse. There are many obstacles blocking the easy composition resulting in limited use of service compositions in practice.

The creation of a composition within an organizational network can easily be viewed as a simple and straightforward process, but in fact is a very complex endeavor and can be characterized by organizations having an already available set of services, having many interdependencies, and different aims (Feenstra et al., 2007). For example the comparison of travel insurance policies can potentially be reused for comparing other types of insurances and even other types of products like books and cars. Yet this would require that characteristics can be changed, the interface used matches the interface of single items that are compared and so on. Furthermore whereas customers want to compare products, the product providers (insurance companies) might not want this or are afraid that comparison will take place based on a limited amount of characteristics which might not be in favor of their products. Existing composition methods are often supply-driven as they assume the presence of a set of interoperable services an consensus about the objectives (Milanovic & Malek, 2004). What might be viewed as a process of selecting components can easily result in the need to develop new components, struggling about the interpretation of functionality and performance and finally resulting in expensive and time-consuming implementation projects. The complexity and heterogeneity of the organizations might serious hamper development. Components might simply not be available or not fit the desired purpose. Further, Liang, Huang and Chuang (2007) found that there were the constraints of non-functional service properties are hardly taken into account. Already existing services can complicate the reuse process, as the modules are not determined using a conscious design process and the effectiveness of a “modularization” is dependent upon the criteria used in dividing the system into modules (Parnas, 1972). As a result, existing composition methods are not adopted by the field.

The goal of this paper is to present a demand-driven service composition method and to evaluate the merits and disadvantages of this method. This method should be able to deal with the distinguished characteristics of organizational networks. In the following section we discuss the theoretical background and the requirements on a composition approach for organizational networks. This is followed by our research approach. In section three the composition method is presented and subsequently evaluated in section five. Finally, we discuss the results and draw conclusions.

BACKGROUND
Organizational Networks
Organizations collaborate in networks to benefit from each other’s resources and competition is shifted towards competition between networks instead of single organizations. Organizational networks consist of many organizations that are independent and make their decisions autonomously. Their decisions and behavior
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