

A Formal Reuse-Based Approach for Interactively Designing Organizations (extended abstract)¹

Catholijn M. Jonker^a Jan Treur^{a,b} Pinar Yolum^a

^a Vrije Universiteit Amsterdam
Department of Artificial Intelligence
De Boelelaan 1081a, 1081 HV Amsterdam, The Netherlands
URL: <http://www.few.vu.nl/~{jonker, treur, pyolum}>

^b Universiteit Utrecht, Department of Philosophy
Heidelberglaan 8, 3584 CS Utrecht, The Netherlands

Organizations are an important metaphor for developing multiagent systems. Organizations provide a template of rules for agents to follow to accomplish large-scale tasks [1]. When designed modularly, organizations make it possible to divide a large-scale task among small groups of practice and coherently put together the individual outputs of the groups to accomplish the large-scale tasks of interest. We consider the problem of designing organizations. Such an organization design process for example starts by formally specifying requirements for the overall organization behavior. The requirements express the dynamic properties that should hold if appropriate organizational building blocks, such as groups and roles and their interactions, are glued together appropriately [2]. In addition, there could be requirements on the structure of the desired organization that is going to be designed. Given these requirements on overall, organizational structure and organizational behavior are designed and formally specified so that the requirements are fulfilled. However, designing the individual groups from scratch is labor-intensive, requiring expertise and domain knowledge.

We argue that once designed and formally specified, parts of an organization can be reused by other organizations. The approach we take is the following:

1. Groups are characterized from an external perspective by abstract identifiers at different levels of abstraction.

¹ Full paper to appear in *Proceedings of the AAMAS Workshop on Agent-Oriented Software Engineering (AOSE'04), 2004.*

2. The complete group specification (from an internal perspective) is stored in the library, and indexed with the identifiers obtained in 1.
3. An organization designer queries the library for a group based on certain information expressed in terms of the characterizing identifiers.
4. The library returns all groups that match the query, based on a matching function.
5. The organization designer reviews the returned groups and incorporates one of them possibly modifying it as necessary.

The methodology indexes organizational components based on abstract identifiers that capture their functionality (what it does) and additional metadata that provide information on the workings of the component (how it does). Such metadata can include factors such as environmental assumptions or realization constraints. The components are indexed with identifiers that are structured in multi-dimensional taxonomies [3], which allow a designer to find the same component by formulating a query in a variety of dimensions. An organization designer can interactively search a library of components to find a component that fits her needs and possibly tailor it to her needs. Further, the system can exploit the library structure interactively to help designers reformulate their queries more precisely. If a system designer does not manage to formulate a precise query, the system will find an identifier of interest that lies higher in the taxonomy. Then, the system will help the designer by posing different branches of the tree as optional identifiers.

References

1. Kathleen M. Carley and Les Gasser. Computational Organization Theory in Multiagent Systems: A Modern Approach to Distributed Artificial Intelligence. Chapter 7. MIT Press, 1999.
2. Catholijn M. Jonker and Jan Treur. Compositional Verification of Multi-Agent Systems: a Formal Analysis of Pro-activeness and Reactiveness. International Journal of Cooperative Information Systems, vol. 11, pp. 51-92, 2002.
3. Catholijn M. Jonker and A. M. Vollebregt. ICEBERG: Exploiting Context in Information Brokering Agents. In: Proceedings of the Fourth International Workshop on Cooperative Information Agents (CIA), LNAI 1860, pp. 27-38, Springer-Verlag, 2000.