

Chapter 5.1

The Socio–Technical Virtual Organisation

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ABSTRACT

A Virtual Organisation (VO) or Virtual Enterprise is a loosely-coupled group of collaborating organisations, acting to some extent as though they were part of a single organisation. This implies that they exhibit some properties of a conventional organisation without actually being one. In practice, this involves overcoming organisational boundaries, which tend to make collaborative working difficult. The authors of this chapter propose that this is a socio-technical problem, requiring both a technical (software) infrastructure and a sociological approach to building, deploying and operating the VOs supported by it. This joint approach can help to overcome some of the problems associated with collaborative working, ranging from poorly coordinated activity, to ineffective problem solving and decision-making. The authors describe a socio-technical approach to building and operating VOs in highly dynamic environments and present two factual scenarios from the chemical and health industries. They describe a platform supporting such VOs, which was developed as part of the EPSRC E-Science Pilot Project GOLD.

INTRODUCTION

We propose that the building and operation of virtual organisations (VOs) is a socio-technical problem, requiring both a suitable technical infrastructure and a sociological method for build-

ing and evolving VOs supported by it. Such an approach is necessary because of the complexity and dynamism inherent in many VOs, particularly those involving novel aggregations of knowledge, skills and expertise or which exist in uncertain or highly-dynamic environments. Because of these traits, meaningful integration of diverse organisations to realize some coherent enterprise

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can be difficult (Ludwig & Wittingham, 1999). Organisational boundaries, including technical, cultural, procedural, managerial structural and others limit the potential for interaction. In particular, they can reduce an enterprise's ability to solve problems and make decisions in response to changing circumstances (Jarratt & Fayed, 2001).

Organisational boundaries can be overcome with large amounts of shared infrastructure, but at high financial cost and to the detriment of agility, autonomy and time to market. If an enterprise is to achieve coherence whilst retaining such traits as agility and flexibility, it must rely on a service-based, federated infrastructure which can be rapidly co-configured and reconfigured by participant organisations. This requires a deep understanding of the nature of the enterprise, the roles and relationships of its participants and the impacts of events or changes on other participants and on the subsequent activities of the enterprise. For this reason we present an approach that brings together research from sociology and computer science. The result is a software architecture that is flexible and agile enough to support the almost infinite number of deployment scenarios required by actual VO protagonists plus methodology, supported by tooling, which enables the rapid development of connected rich pictures (Checkland & Scholes, 1990) describing the enterprise to be undertaken. These rich pictures can be used to configure the deployment scenarios and can become part of the VO's instrumentation, so that the primary means of understanding and communicating information about the enterprise also becomes the primary means of interacting with it.

This chapter will explain some of the problems and issues relating to the crossing of organisational boundaries, particularly among complex, dynamic and 'knowledge-oriented' VOs. It will describe some important non-functional requirements that are desirable in this type of VO. It will then outline our socio-technical approach to building VOs, illustrating it with two factual scenarios from the chemical R&D and multi-agency health

care industries. The chapter concludes with a description of a socio-technical platform developed in collaboration between the EPSRC e-Science Pilot Project GOLD and Newcastle University's Centre for Knowledge, Innovation, Technology and Enterprise (KITE).

BACKGROUND

It has been remarked that there are as many definitions of "Virtual Organisation" as there are researchers in the field (Metselaar & Van Dael, 1999). In practice, these definitions tend to fall roughly onto a spectrum with an emphasis on the sharing of physical resources such as storage and processing power at one end and an emphasis on exploiting novel aggregations of knowledge, skills and capacity at the other. At the more 'resource-oriented' end of the spectrum, VOs are often characterised by relative stability; well-defined central or hierarchical management; well-defined access to resources across simple interfaces; easily-defined tasks; and a set of well-understood, well-communicated common goals (Foster, 2001). An example is an outsourced data processing facility, where data is securely shipped off-site for manipulation by third-party algorithms using grid technology because the client does not possess either appropriate algorithms or required processing power in-house. The problems and issues associated with these types of VO are largely *technical*, including:

- How to overcome local technical restrictions such as firewalls; details of internal networks etc.
- How to provide secure, governable access control to shared resources.
- How to coordinate resource use across organisational boundaries
- How to protect information security
- How to generate evidence of activity in the event of disputes

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