Chapter 4
Putting Interoperability on the Map:
Towards a Framework of Interoperability Approaches and Tools

Stelios Eliakis
Athens University of Economics and Business, Greece

Eleni Zampou
Athens University of Economics and Business, Greece

Katerina Pramatari
Athens University of Economics and Business, Greece

ABSTRACT
Information sharing and interoperability are key ingredients for any system that participates in Service Oriented Architectures (SOA) and wants to communicate and exchange information with other partners. Although there are many technologies that support interoperability, there is apparently no relevant research about how to extract and aggregate the requirements of a system, the necessary architecture components and tools regarding interoperability. This chapter reviews the principles and the constraints that affect architecture design and the research efforts about interoperability infrastructures, and proposes a set of architecture components and tools that can enable, support and maintain interoperability in heterogeneous, dynamic, and constantly changing environments.

INTRODUCTION
In the current industrial and economic context, enterprise systems need to be constantly and smoothly re-engineered to respond to changing market demand and technological evolution. Enterprise architecture, considered as the foundation of enterprise systems engineering, has emerged as a ‘tool’ to help stakeholders to manage system engineering and changes and enable the efficient communication among different parties (Chen, Doumeingts, & Vernadat, 2008).
One of the difficulties that enterprises are facing concerns the lack of interoperability of systems and software applications to manage and progress in their business. Organizations are looking for new methods of work and business relationships. Unfortunately, it is often incapable the exchange of information and documents with new partners to be executed automatically and in an electronic format. This is mainly due to incompatibility problems in the representation of information and in the software application methods adopted (Jardim-Goncalves, Grilo, & Steiger-Garcao, 2006). A critical factor for the realization of e-business, e-government and enterprise systems is the achievement of interoperability amongst several different information systems (Scholl & Klischewski, 2007).

Interoperability is the ability of disparate and diverse organizations to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between the organizations via the business processes they support, by means of the exchange of data between their respective information and communication technology (ICT) systems (Chen, et al., 2008; IDABC, 2008). European Commission has focused on the pan-European dimension of interoperability mentioning mainly the requirements for e-government information systems and their implementation (Interoperability Decision 1720/1999/EC).

Besides e-government, information sharing and interoperability is a key ingredient for any Supply Chain Management (SCM) system (Moberg, Cutler, Gross, & Speh, 2002). Many researchers have suggested that the key to the seamless supply chain is making available undistorted and up-to-date marketing data at every node within the supply chain (Childhouse & Towill, 2003; Towill, 1997). By making the data available and sharing them with other parties within the supply chain, an organization can speed up the information flow in the supply chain, improve the efficiency and effectiveness of the supply chain, and respond to customer changing needs quicker (Li & Lin, 2006). Therefore, information sharing will bring to the organization a competitive advantage in the long run.

At the same time, the coordination processes that chain members are engaged in, have increased in complexity in the recent years and have become more information-intensive (Soroor, Tarokh, & Shemshadi, 2009). Very often chain members are involved in several supply processes at the same time. Under these circumstances, communications and real-time coordination between mobile and distributed supply chain members is difficult, making the need for an efficient communication infrastructure, that provides reliable on-demand access to both supply process information and related personnel, more acute (Anumba, Aziz, & Obonyo, 2003).

More than a decade after interoperability issues have been raised and discussed within a large number of communities, interoperability is still a problem for enterprises. Integration projects remain complex and expensive. Although most firms in the EU-25 are connected to the Internet (91.1% in 2005), only a minority use e-business solutions for linking internal processes (33.5% in 2005); and an even smaller minority use e-business solutions for linking with business partners (15.1% in 2005). Moreover, the gap between the use of e-business between SMEs and large enterprises remains substantial: only about 30% of the firms that use e-business solutions are SMEs. The use of enterprise integration systems among all EU-15 firms is tiny – 10.2% use such systems to integrate with suppliers and 9.3% use such systems to integrate with customers (European Commission, 2008).

According to an article on interoperability published in Financial Times, successful interoperability dramatically cuts the costs, risks and complexities of hooking up and represents a challenge to competition policies in Europe and America (Schrage, 2009). Yankee Group further advises IT departments to focus on interoperability technolo-