Chapter 91
Interoperability Issues of Business Processes:
Key Issues and Technological Drivers

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INTRODUCTION

At the beginning of the third millennium, we are facing one of the most important transition challenges: to build an electronic society. In that movement, EC (Electronic Commerce) represents one of the major driving forces that survived two big failures in the past, represented by EDI (1980s) and "dotcom era" (1990s). Despite different network technologies, EDI (Electronic Data Interchange) over OSI (Open Systems Interconnections) vs. dotcom over the Internet both left out of the e-business too many companies (e.g. most of SMEs, Small-to-Medium Enterprises). After disillusionment and failure analysis, new expansion of EC is taking place, especially in the form of B2B. In such circumstances there is a lot of heterogeneity between business processes, supported applications and associated data on one side and different hardware, operating systems, database systems, network infrastructure, etc. on the other side, that make huge difficulties and barriers in achieving the full potential of EC (Medjahed et al., 2003; Kajan & Stoimenov, 2005; Hepp, 2006). Similar situation is taking place inside companies where A2A (Application-to-Application) costs for data integration and access software were about $2.5 billion in 2007 and are going to grow further (Bernstein & Hass, 2008).

In order to reach full interoperability inside business entities and between them as well, various technologies and frameworks are being proposed and deployed, but none of them has yet brought EC to its full potential. This chapter gives an overview of main obstacles, a critical assessment of existing approaches and recent research efforts in order to overcome interoperability problems.

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INTEROPERABILITY ISSUES

At least three types of *interoperability* (according to the main task that should be performed), communication, syntactic, and semantic, are crucial. *Communication interoperability* must be able to bring the data from one place to another on time with the required quality. It relies on the infrastructure and standardized protocols where all the necessary data are precisely defined (e.g., encapsulation, frames, checksum algorithms, etc.). Despite the widespread and longtime use of TCP/IP protocol stack, new application requirements caused a flood of new protocols, thus the number of RFCs (Request for Comments) by the end of 2008 has grown over 5,400. However, this exciting research field does not endanger the main task of this level. The main obstacles that reduce communication interoperability are poor and/or expensive communication infrastructure, the situation existing in most countries outside the developed world making the so-called digital divide deeper than ever. There are many case studies that investigate particular country or region from that point of view, a good overview of which is available in (Roubiah, et al., 2009).

The main task of *syntactic interoperability* is to provide a data format understandable by peers. It should allow content exchange among multiple software components independently of their implementation languages, run-time environments and other technological differences.

Unlike syntactic interoperability where the main issue focuses on data formats, s*emantic interoperability* focuses on data meaning. It provides peers with the ability to overcome semantic conflicts arising from differences in implicit meanings, perspectives, and assumptions in the data, business processes and so on. The sources of semantic conflicts are the subject of the next chapter.

The problem of interoperability exists in all application areas of information systems. In EC, there are two main fields of interoperability widely known as *A2A* and *B2B*. They have much in common, but they are also different. Business processes inside an enterprise (here and after business entity, *be*) have their private and public parts. The private part of a business process is visible only inside a business entity interacting with other internal business processes whilst the public part acts inside the business entity but also takes place in B2B processes interacting with the public parts of business processes that belong to the other *be*, as shown in Fig. 1. A2A serves as an important mechanism in order to achieve business goals, but also serves as a flywheel of B2B efforts of that *be*. As much as a *be* reaches full A2A, i.e. achieves ZLE, its chances to have successful B2B relationships with other *bes* are growing.

The main goal of B2B is to provide *bes* with the ability to establish business relationship in such a manner that their public business processes may interact with each other exchanging their data. In a business scenario, business entities are usually loosely coupled; that means business processes require ad hoc integration from time to time. Such integration on demand may experience many conflicts. Problems arise due to the huge heterogeneity between business processes and data involved, which are both different by nature on the one side and on the other side between underlying IT technologies, which are different by default.

Both, A2A and B2B interoperability are victims of heterogeneity mentioned above. From that point of view, the main difference between them is the ability to control heterogeneity, which is much easier in a single company. In B2B environment, where huge number of potential participants may exist, the autonomy of every *be* how to run own business and by which software is out of question. Thus B2B experiences many more difficulties in interoperability than A2A.