

Chapter 30

A Conceptual Framework for Enterprise Interoperability

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ABSTRACT

The obligation to become more competitive and effective in providing better products and services requires enterprises to transform from traditional businesses into networked businesses. One of the challenges faced by a network of enterprises is the development of interoperability between its members. Transformations in this context are usually driven by Enterprise Interoperability (EI) problems that may be faced. In order to quickly overcome these problems, enterprises need characterizing and assessing interoperability to be prepared to establish means for collaboration and initiate corrective actions before potential interoperability problems occur and then be obliged to make unprepared transformations that may be costly and induce unmanageable issues. This has become a significant research challenge over the past few years and maturity models have been developed in response to this challenge. In this paper we propose to extend a maturity model based on an ontological formalization of the interoperability domain. This will allow diagnosing interoperability problems when assessing EI and having a conceptual framework as basis for an automatic assessment tool.

INTRODUCTION

Historically, progress occurs when entities communicate, share information, and together create something that could not be achieved alone. Moving beyond people to machines and systems, interoperability is becoming a key factor of success in all domains. Interoperability seems to be a straightforward concept. However, there is no common definition or shared comprehension of it. Each expert defines and understands interoper-

erability, according to his domain. To deal with this research gap, the Ontology of Interoperability (OoI) was proposed to formalize the interoperability domain while defining also problems and solutions pertaining to it. As interoperability is a general issue that is tackled through many different domains such as military, software, information systems, modeling, organizations or health, the OoI was based on the General System Theory (GST) (Bertalanffy, 1968) to have a general consensus that stays applicable to any interoperability

domain. The OoI was thereafter extended to the Enterprise Interoperability (EI) domain by defining the Ontology of Enterprise Interoperability (OoEI) (Guédria, 2012).

Growing globalization, competitiveness and rising environmental awareness are driving many companies to control their interoperability strategy. Numerous models, methodologies, tools and guidelines exist that can help an organization, an enterprise, or more generally a system, to develop interoperability and improve the way it operates with others. Developing interoperability requires considerable costs and efforts. Characterizing and measuring interoperability, allows an enterprise to define its needed interoperability level and to plan the migration path to reach it. This has become a significant research challenge over the past few years and maturity models have been developed in response to this challenge. A survey of the most known ones (Guédria, 2012; Ford, 2008) has revealed that, in most cases, existing maturity models focus on one single facet of interoperability (e.g. data, technology, conceptual, enterprise modeling, etc.). As a response to this problem, a new maturity model following a general view of the EI domain was proposed: the Maturity Model for Enterprise Interoperability (MMEI) (Guédria, 2012; Chen, 2013). The particularity of this maturity model is to be based on existing models and to have a systemic view of the enterprise.

In this paper, we use the OoEI meta-model and the MMEI maturity model to define a conceptual model that integrates concepts from the two models in order to diagnose interoperability problems and simplify the assessment process by having the required information. This will in particular help enterprises in diagnosing interoperability problems while assessing their ability to interoperate and to prevent actions to undertake.

The paper is structured as follows: Section 1 presents the research context of this work. Section 2 gives an overview of the OoEI. The MMEI model is presented in section 3. Section 4 defines the conceptual framework, resulting from the

identification and integration of relevant concepts from the OoEI and MMEI. An illustrative example is then presented in section 5. Section 6 concludes and presents future work.

RESEARCH CONTEXT

Generally speaking, interoperability is the ability of two or more systems or components to exchange information and to use the information that has been exchanged (IEEE., 1990). When this ability is not achieved, interoperability becomes a problem that must be solved.

Solutions to interoperability problems can be characterized according to interoperability approaches defined in (ISO14258, 1999). EI problems can be localized into interoperability barriers and characterized by EI concerns, as defined in the Framework for Enterprise Interoperability (FEI). FEI has been initially elaborated in INTEROP NoE (Chen, Dassisti, & Elvester, 2007) and is now published as an international standard (ISO 11354 - 1). It defines a classification scheme for interoperability knowledge according to three dimensions:

- Interoperability concerns, defining the content of interoperation that may take place at various levels of the enterprise (data, service, process, business).
- Interoperability barriers, identifying various obstacles to interoperability in three categories (conceptual, technological, and organizational).
- Interoperability approaches, representing the different ways in which barriers can be removed (integrated, unified, and federated).

The first two dimensions interoperability concerns and barriers, constitute the problem space of enterprise interoperability (EI). In order to avoid such problems, enterprises need to know their

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