Handbook of Research on E–Business Standards and Protocols:
Documents, Data and Advanced Web Technologies

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Volume I
<table>
<thead>
<tr>
<th>Detailed Table of Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
</tr>
<tr>
<td>Preface</td>
</tr>
<tr>
<td>Acknowledgment</td>
</tr>
<tr>
<td>Volume I</td>
</tr>
<tr>
<td>Chapter 1</td>
</tr>
<tr>
<td>An Introduction</td>
</tr>
</tbody>
</table>

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The reality of E-Business today means E-Commerce, E-Collaboration, E-Government, E-Procurement, Social Networks, et cetera. Independent of the selected area E-Business will only work if interoperability in all its facets and visible E-benefits are ensured. This includes common agreements about the targets, objects, and rules of the E-Business, concepts, frameworks, and models that are well understood, accepted, and provide additional E-Benefits for all participating partners. In addition, ICT systems, tools, and other instruments must be compliant with political and legal restrictions and support the work properly and efficiently, and last but not least, ensure trust and minimize E-Business risks. With the rise of the Internet, its online-service, manifold techniques, and E-Business applications, people expected quick, usable, and efficient solutions for these problems. Really, many profitable and well-working individual solutions on the market may be found. But there still is a gap in looking for generally well-working interoperability solutions like standards, harmonized E-Business legal regulations, easy to understand, and useable ICT infrastructures and tools, and for general solutions to guaranty security and trust in E-Business. This handbook aims to show the state of the art in research and practice in building, managing, and maintaining E-Business solutions under the focus of enhancing interoperability based on standards, protocols, and other helpful concepts, instruments, and examples. To get a better understanding also for non-specialists, the authors systemize the complex and interdisciplinary content and offer additional helpful explanations.
Section 1
General Approaches to E-Business Interoperability: Standards, Data Exchange, Semantics

Chapter 2
The Reality of Using Standards for Electronic Business Document Formats ................................................. 21
   Tim McGrath, Document Engineering Services, Australia

This chapter presents the challenges faced when developing and using standard formats for electronic business document exchange and tries to identify the real values and costs. As a reference it takes the OASIS Universal Business Language (UBL) and demonstrates how, despite the challenges, UBL can provide a common bridging format (sometimes called a “lingua franca”) for exchanging business information between different communities.

Chapter 3
Analysis of Interoperability of e-Business Documents ................................................................. 33
   Ivan Magdalenić, University of Zagreb, Croatia

The purpose of this chapter is to provide insight into factors that influence the development of electronic business documents and their exchange. In particular, the chapter addresses the issue of achieving interoperability between partners involved in electronic communications. It gives an overview of problems that occur at each level of interoperability and suggests ways to resolve them in accordance with current trends. The chapter also contains a projection of future developments in the field including the use of ontologies in business documents.

Chapter 4
Harmonized and Reversible Development Framework for HLA based Interoperable Application ......................................................... 58
   Zhijing Tu, IMS-LAPS, Université de Bordeaux, France
   Gregory Zacharewicz, IMS-LAPS, Université de Bordeaux, France
   David Chen, IMS-LAPS, Université de Bordeaux, France

This chapter aims at proposing an approach to implement a distributed Information System built on top of a federation of existing (reused) software components. This solution is taking as a core consideration the problem of interoperability of data exchanged between enterprises. The idea is to adapt and reuse experiences coming from the development of enterprises legacy Information Systems in order to create a HLA (High Level Architecture) based system of systems. In that perspective, this chapter proposes a new bi-directional development life cycle. MDA (Model Driven Architecture) and HLA FEDEP (Federation Development and Execution Process) are combined and harmonized to implement distributed Information Systems from enterprise models of existing system. Conversely, model reverse engineering techniques are used to help re-implement existing systems, in order to be interoperable without being fully reconstructed. Then, according to HLA 1516 evolved new features, this chapter proposes a solution based on an open source RTI, poRTIco, to implement Web enabled federates.
Chapter 5
Concepts for Enhancing Content Quality and eAccessibility: In General and in the Field of eProcurement

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Helmut Beckmann, Heilbronn University, Germany

The important aspect of interoperable content and content accessibility is still not sufficiently acknowledged in most eApplications. Although pertinent standards exist, some of them need revision and additional standards are needed for new requirements. The Recommendation on software and content development principles 2010 formulated at the 12th International Conference on Computers Helping People with Special Needs (ICCHP 2010) addresses this situation. This chapter gives an overview of the state of the art with a special focus on eProcurement. It argues that eAccessibility in eProcurement cannot be achieved without taking care of content interoperability and accessibility. This would not only help persons with disabilities (PwD) whose numbers are increasing by the day to live a more independent life and to enjoy better education, but also create new job opportunities in the ICT (information and communication technologies) and ICT-related content and service industries as well as in the field of eProcurement itself.

Chapter 6
BOMOS: Management and Development Model for Open Standards

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E-Business standards, or standards for interoperability, are developed outside the traditional standard development organizations, often within industry specific domain organizations. These organizations need some guidance in how to develop and manage standards for their specific domain in order to achieve long lasting standards that actually achieve interoperability between organizations. The Dutch government, together with the standards community, decided to publish a tool called BOMOS for giving guidance to the management and development of open standards. BOMOS is not profoundly grounded on scientific evidence, but it builds on the best practices already used in domain standardization. This chapter will present two highlights of BOMOS: the activity model for management of standardization, and a development approach for standards.

Section 2
General Approaches to E-Business Interoperability: Interdisciplinary and Applications-Oriented Concepts

Chapter 7
Interoperability Support for E-Business Applications through Standards, Services, and Multi-Agent Systems

Rainer Unland, Institute for Computer Science and Business Information Systems (ICB), University of Duisburg-Essen, Germany
Intelligent agents can be regarded as autonomous, problem-solving computational entities with social abilities that are capable of effective pro-active behavior in open and dynamic environments. If the term entity is replaced by service the substantial overlap in interests between both communities can easily be imagined. Nevertheless, right now the main research focus of each community seems to be different. The service-oriented computing community concentrates mainly on developing service engineering methodologies. Active topics in the multi-agent systems community are collaboration, self-organization, adaptability, flexibility, proactiveness, and interoperability. The overlap between those two communities and the fact that they concentrate on different research topics can definitely be seen as a huge chance since it means that each community may be able to benefit from the research efforts of the other.

Chapter 8
Ontologies for Guaranteeing the Interoperability in e-Business: A Business Economics Point of View

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For e-business, the computer-based processing of value-creation, especially for knowledge-intensive business processes, plays a prominent role with the help of modern information and communication techniques. At least since the further development of the classical Internet for the Semantic Web, the content-based knowledge processing and knowledge transfer have gained more importance. In this chapter it is shown that ontologies represent an auspicious instrument to ensure the interoperability of information and communication systems that have to work together on the work-sharing development of knowledge-intensive business processes. Ontologies become important when agents with heterogeneous knowledge backgrounds co-operate on such business processes. Firstly, the complex and often ill-considered use of the definition of ontology will be discussed critically and its meaning specified. Thereupon it will be shown (with the help of two application areas) how ontologies can be used effectively to support knowledge-intensive business processes in e-business. On the one hand, the chapter is concerned with the management of knowledge of competences, which agents have to have a command of for successful process execution. On the other hand, it is about the management of know-how, which has already been collected from completed projects and should be reused in new projects.

Chapter 9
How Semantic Web Technologies can Support the Mediation between Supply and Demand in the ICT Market: The Case of Customer Relationship Management

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Diego Magro, University of Torino, Italy

This chapter presents the ARNEIS framework, i.e., an architecture enabling intelligent Web-based repositories of descriptions of software products and services. ARNEIS exploits Semantic Web technologies in order to support the interaction between ICT companies offering software solutions for business
automated, and small-to-medium sized enterprises looking for technological support to their business. In particular, the authors chose Customer Relationship Management (CRM) as a field for the evaluation of the framework, and thus in this chapter, they describe how the ARNEIS framework enables a Web-based service that supports an intelligent matching between supply and demand for CRM-related tools. After presenting the background of the project and discussing related work, the chapter describes the ARNEIS framework, starting from its architecture and user interaction flow. The domain analysis of the CRM field and role of ontologies is then discussed. The chapter then focuses on the user interfaces and matching between semantic descriptions of offers and needs. A brief discussion of future challenges concludes the chapter.

Chapter 10
Customer Decision Making in Web Services ................................................................. 210
Zhaohao Sun, University of Ballarat, Australia
Ping Zhang, CSIRO, Australia
Dong Dong, Hebei Normal University, China

Web services play an important role in successful business integration and other application fields such as e-commerce and e-business. Customer decision making (CDM) is an indispensable factor for e-business and Web services. This chapter examines customer decision making in Web services. More specifically, it first looks at decision making in Web services, and proposes a novel P6 model for CDM in Web services, which consists of 6Ps: privacy, perception, propensity, preference, personalization, and promised experience. This model integrates the existing 6 P elements of marketing mix as the environment of customer decision making in Web services. The new integrated P6 model deals with the inner world of the customer for decision making (DM) and incorporates what the customer sees and thinks during a DM process. The purpose of this novel P6 model is to assist customers in the decision process to acquire the most satisfactory Web service. This chapter also examines case-based decision making in Web services and provides a theoretical foundation for case-based decision making under the condition of one problem with multiple solutions in Web services. The proposed approach will facilitate research and development of e-business, Web services, decision support systems, intelligent systems, and soft computing.

Chapter 11
The Metaphorical Foundation of Interoperability Artifacts: The Case of Public Services.......... 233
Veit Jahns, University of Duisburg-Essen, Germany

In this chapter, artifacts designed to facilitate the semantic interoperability between Information Systems are discussed in relation to the so-called metaphor theory. The main assumption of this theory is that the conceptualization of the world is mainly a metaphorical one; i.e., the concepts of a given domain are conceptualized by concepts of a more concrete domain. Based on this theory, selected interoperability artifacts for the modeling and describing public services are discussed and analyzed. In particular, it will be demonstrated how the conceptual metaphor can be used to get a better understanding of the domain the interoperability artifacts are designed for.
Chapter 12
Standards for Achieving Interoperability of eGovernment in Europe

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E-government interoperability frameworks in Europe and the standards they reference are diverse, often reflecting different legal and policy priorities across the continent. Selected examples from a number of member states illustrate how legal interoperability impacts the choice or creation of e-Government standards. It looks at the situation of technical interactions, especially the use of web service standards, then at two data exchange standards, two metadata standards, and the current work on linked open data. The examples discussed represent different use cases (Government to Government / G2G, Government to Business / G2B, Government to Citizen / G2C), allowing an overview over the current situation in Europe.

Section 3
Standards for Security and Trust in E-Business

Chapter 13
Fundamental Building Blocks for Security Interoperability in e-Business

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The e-business concept goes beyond traditional electronic enterprise systems that are typically owned and controlled by one company. In e-business systems the data is exchanged in a distributed environment where different components and systems are owned and controlled by different companies. This introduces two main challenges: (1) there is a need for adequate security mechanisms that can protect the data in an end-to-end manner (2) the security mechanisms deployed in e-Business systems must be interoperable to ensure that they work with the security mechanism of others’ systems. This chapter makes an overview of security mechanisms applicable to e-Business, as well as relevant security standards. The chapter also gives an outlook on novel approaches to e-Business security.

Chapter 14

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Sven August, Christian-Albrechts-University of Kiel, Germany
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An increasing need for security in SOA applications demands for better support for the management of security in Web-based business processes. Here, the model-driven process development may provide valuable opportunities in terms of maintainability and deployment. Besides modeling and then generating the pure functionality of a process, the consideration of security properties at the level of a process
model allows us to derive appropriate Web Service security policies as well. Especially important when dealing with security issues is the need of trust in the deployed processes and the development process as well. In this chapter, the authors discuss the general capabilities and constraints for model-driven security. Furthermore, the authors focus on the automatic transformation of security models into executable security implementations as well as on the validation of the security models to ensure their correctness. Based on the discussion, the authors present a transformation mechanism that automatically derives WS-SecurityPolicy-conformant security policies. Moreover, the chapter presents a validation mechanism for the security model which is based on graphical validation rules. The application of both mechanisms allows the automatic deployment of validated, security-enabled Web Service based business processes.

Chapter 15
Trust Management and User’s Trust Perception in e-Business ......................................................... 321
Elisa Costante, TU/e Eindhoven University of Technology, The Netherlands
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Trust is essential in the e-business world: to allow the cooperation needed in this setting, independent service providers have to trust each other and, also, end-users have to trust service providers. Trust Management, i.e. the process of establishing trust amongst the parties involved in a transaction, can be carried out using different approaches, methods and technologies. The end-user is an important party involved in this process. Trust Perception models attempt to understand the end-user’s point of view and the pattern he adopts to trust a service over the Internet. In this chapter the authors provide a state of the art for Trust Management in e-business. They review the most important Trust Management technologies and concepts including credentials and PKI, reputation, authorization and access control, trust policies, and trust languages. A conceptual map is presented clarifying the meaning and the links between different elements of a Trust Management system. Moreover, the authors discuss the end-user’s Trust Perception. The chapter presents a literature study on Trust Perception models and introduces the new model, able to list the trust signals the end-user considers to make trust decision. Examples of such signals can be the reputation of a website, the use of security protocols, the privacy policies adopted, and the look and feel of its user interface. Finally, the directions of future work are presented, and conclusions are drawn.

Section 4
Dealing with E-Business Data: Classification, Exchange, Harmonization

Chapter 16
Privacy-Conscious Data Mashup: Concepts, Challenges and Directions............................................ 343
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Chirine Ghedira, Claude Bernard Lyon 1 University, France
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Modern enterprises across all spectra are increasingly adopting SOA-based data integration architectures to rapidly respond to transient data business needs. In this chapter, the authors analyze a new class of enterprise data integration application, called Data Mashup, in which data services are composed on the fly to answer new data business demands. The chapter reviews the different approaches to data mashup, discusses their limitations, and identifies the main requirements to data mashup. The authors next propose a declarative data mashup approach addressing the identified requirements. Finally, the chapter presents some research directions that must be followed in order for data mashup technology to mature.

Chapter 17
Co-ordination and Specialisation of Semantics in a B2B Relation ................................................. 365
Fred van Blommestein, University of Groningen, The Netherlands

To date, the B2B paradigm includes the publishing of rigid message and process standards by organisations such as GS1, BME, UBL, and UN/CEFACT. Businesses are expected to obey those standards, which may not reflect their commercial or business niche. In this chapter, a mechanism is described to simplify and formalise negotiations on bilateral information semantics and process definitions bilaterally, due to support by automated tools. The mechanism is based on ontology engineering and speech act theory. It results in XML schemas that may directly be implemented in B2B communication. Interfaces with back end systems are created on the fly. Work for this chapter was supported by the European Commission through the 7th FP project ADVANCE (http://www.advance-logistics.eu/) under grant No. 257398.

Chapter 18
An Examination of Standardized Product Identification and Business Benefit................................. 387
Douglas S. Hill, University of Southampton, UK

This chapter goes on a supply chain journey where humankind attempts to make sense of its complex world through the application of numbers and associated data carriers. The trading world is famously becoming increasingly globalised and has had the effect of extending supply chains and subsequently making them more complex and prone to risk. To offset these risks, standards are being developed and applied in supply chains to identify and manage products as they travel along the physical supply chain. The following pages introduce the reader to the concepts of standardised product identity and data management. Both of these elements have been found to be foundational and enabling prerequisites when offsetting supply chain risk. The systems mentioned within the chapter are discussed through the lens of the GS1 system and have all been tested in manifold implementations. They are intended as best practices, patterns of application for supply chain managers, and thought leaders alike, which are proposed as a launch pad for improving organisational capabilities using standards.

Chapter 19
Towards Crowd-Driven Business Processes ................................................................. 412
Maja Vuković, IBM T. J. Watson Research, USA
Claudio Bartolini, HP Labs, USA

Web 2.0 is shifting work to online, virtual environments. At the same time social networking technologies are accelerating the discovery of experts, increasing the effectiveness of online knowledge acquisition and collaborative efforts. Nowadays it is possible to harness potentially unknown (large) groups of networked
specialists for their abilities to amass large-scale collections of data and to solve complex business and technical problems, in the process known as crowdsourcing. Large global enterprises and entrepreneurs are increasingly adopting crowdsourcing because of its promise to give simple, low cost, access to a scalable workforce online. Enterprise crowdsourcing examples abound, taking many different shapes and forms, from mass data collection to enabling end-user driven customer support. This chapter identifies requirements for common protocols and reusable service components, extracting from existing crowdsourcing applications, in order to enable standardized interfaces supporting crowdsourcing capabilities.